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紀 事 Proceedings

1. *Some Molluscan Remains from the Pleistocene Deposits of the Kwanto Region*

By

Tuneteru ÔINOMIKADO

Of four species referred to in this note, *Mysella paula* (A. ADAMS) has been reported from the fossil beds of Tako-mati, Tiba-ken by Messrs. SUZUKI and TAKAI, while *Nassarius gemmulatus* (LAMARCK) from Okine, Nagai-mati, Kanagawa-ken is listed by Mr. SUZUKI in his paper "On the Pliocene series near Atuki, Kanagawa Prefecture. Part II" (Jour. Geol. Soc. Tokyo, **39**, 462, 1932). I discovered other localities of these species where two other species were found, namely, *Macra dolabrata* REEVE and *Scarlesia simosensis* n. sp. These specimens are stored in the Tokugawa Institute of Biological Research.

Mysella paula (A. ADAMS)

Pl. I. figs. 1, 2.

1856 *Pythina paula* A. ADAMS, Proc. Zool. Soc. London., p. 47.

1856 *Pythina peculiaris* A. ADAMS, Proc. Zool. Soc. London., p. 47.

1885 *Montacuta paula*, SMITH, Challenger Report, Lamellibr., p. 203, Pl. 12, f. 1, 1b.

1935 *Mysella paula*, SUZUKI and TAKAI, Jour. Geol. Soc. Japan, **42**, 496, p. 6.

Shell small, rather thin; anterior and posterior margins rounded; antero- and postero-dorsal margins slightly arched and sloping, ventral excavated in middle. Surface ornamented with only fine growth-lines. In right valve (according to SMITH) two widely divergent cardinal teeth separated from dorsal margins by a deep groove; anterior rather shorter than posterior, both prolonged some distance parallel with dorsal edges. In the other valve, edge prominent on each sides so as to fit in grooves in opposite valve.

Measurement.—Length, 5.3 mm, height, 2.6 mm.

Occurrence.—Atohara, Hunasima-mura, Ibaraki-ken (about 8 km south-east of Tutiura-mati).

Living—Awazi (YAGURA), Torres Strait, Ceylon (A. ADAMS), South of New Guinea (Challenger).

Smith carefully studied the two forms of A. ADAMS, and combined them into a single species. In the living state, this peculiar shell attaches itself to the columella of certain *Gastropoda*.

Mactra (Mactrinula) dolabrata REEVE

Pl. I. figs. 3, 4.

1854 *Mactra dolabrata* REEVE, Conch. Icon., sp. 107.

1884 *Mactra dolabrata*, WEINKAUFF, Syst. Conch. Cab. Mart. Chem., *Mactra*, p. 93 Pl. 31, figs. 5.

1917 *Mactra dolabrata*, LAMY, Jour. de Conch., **63**, p. 275.

1932 *Mactra (Mactrinula) dolabrata*, PRASHAD, Siboga Exped., Lamellibr., p. 210, Pl. 6, figs. 3, 4.

REEVE describes this species as follows: "shell oblong, triangular, subquadrate, posteriorly a little gaping, equilateral, beneath the lens very finely transversely striated, shining white, interior side rotundately produced, posterior abruptly slanting, obtusely angled, umboes peculiarly compressed, close; lunule and area rather narrow, excavated, smooth."

The largest left valve in the collection is 38.2mm long and 26.7mm high.

Occurrence.—Atohara and Arayasiki, Hunasima-mura, Ibaraki-ken.

Living.—Kii (KURODA), East coast of Aru Islands (Siboga).

The fossil specimens are identical with those living from Kii. The fossil and living forms in Japan differ from REEVE's specimen in attaining to a larger size and in having their anterior side more produced, although WEINKAUFF was of the opinion that *Mactra dolabrata* REEVE is based on a young shell.

Searlesia simosensis n. sp.

Pl. I, Figs. 5, 6.

Shell fusiform, moderately solid. Five whorls in a height of 24.3mm slightly convex; the last whorl concave below, produced in a slender, somewhat recurved rostrum. Surface sculptured with slightly oblique longitudinal folds and spiral cords. Longitudinal folds rounded, nearly as wide as their intervals, 13 in number on the penultimate whorl, obsolete on the base. Spiral cords alternating with threads or striae, of which there are sometimes two in each interval; coarser cords about 6 in number on whorls of spire, slightly widening as they intersect the longitudinal folds; spirals alone developed on base. Aperture fusiform; outer lip

thin, with folds; inner lip covered with a glaze and smooth; canal short open, slightly bent sideward as well as backward.

Measurement.—Height of 5 whorls, 24.3 mm (apex wanting); diameter 10 mm (holotype).

Occurrence.—Wada, Nakago-mura, Tiba-ken (about 2 km north of Narita-mati).

This species is closely allied to *Searlesia fuscolabiata* (SMITH)¹⁾ (Pl. I. Fig. 7), a species living in Rikuzen and Tugaru Strait. It differs from the latter in that the spire is lower, the whorls are not so convex and the aperture is narrower.

The fossil form is also related to *Searlesia hokkaidonis* (PILSBRY)²⁾, from which it is distinguished in having a less thin shell, the spire moreover being lower than PILSBRY's species.

The present species differs distinctly from *Searlesia japonica* YOKOYAMA, a fossil shell from Sado; the latter being more solid, and having a much more prominent spiral sculpture.

Nassarius (Niotha) gemmulatus (LAMARCK)

Pl. I. fig. 8.

- 1855 *Nassa gemmulata*, REEVE, Conch., Icon., sp. 29.
- 1871 *Nassa gemmulata*, LISCHKE, Jap. Meeres Conch., **2**, p. 167.
- 1874 *Massa gemmulata*, LISCHKE, Ibid., **3**, p. 36.
- 1882 *Nassa gemmulata*, TRYON, Man. Conch., **4**, p. 55, Pl. 17, figs. 312-315.
- 1895 *Nassa gemmulata*, PILSBRY, Cat. Mar. Moll. Japan, p. 35.
- 1908 *Nassa (Niotha) gemmulata*, HIRASE, Conch. Mag., **2**, 6, p. 184, Pl. 30, figs. 119, 120.
- 1928 *Nassa (Niotha) gemmulata*, YOKOYAMA, Moll. Oil-Field Taiwan, p. 40, pl. 2, fig. 8.
- 1932 *Nassarius (Niotha) gemmulatus*, SUZUKI, Jour. Geol. Soc. Tokyo, **39**, 462, p. 118.

This is a very widely distributed and somewhat locally variable species. The fossil form has no prominent tubercles at the shoulder, but differs from *Nassarius (Niotha) livescens* (PHILIPPI) in that the shell is more globose, and also flatly channelled along the sutures.

Measurement.—Height, 27.6 mm; diameter, 16.3 mm.

Occurrence.—Atohara and Arayasiki, Hunasima-mura, Ibaraki-ken. Okine, Nagai-mati, Kanagawa-ken (Suzuki).

-
- 1) *Euthria fuscolabiata* SMITH, Ann. Mag., (1875), p. 422.
 - 2) *Euthria hokkaidonis* PILSBRY, Proc. Acad. Nat. Sci. Philadelphia, **53**, p. 389, Pl. 17, fig. 17.
 - 3) *Searlesia japonica* YOKOYAMA, Foss. Shells Sado, (1926) p. 269, Pl. 32, fig. 22.

Living.—Central and Western Japan; Philippines; Sunda Strait
(YOKOYAMA).

Explanation of Plate I.

Figs. 1, 2. *Mysella paula* (A. ADAMS), 5.3×2.6 mm.

Figs. 3, 4. *Mactra* (*Maetrinula*) *dolabrata* REEVE 38.2×26.7 mm.

Figs. 5, 6. *Searlesia simosensis* n. sp., 24.3×16.3 mm.

Fig. 7. *Searlesia fuscolabiata* (SMITH), living shell from Rikuzen kept in the Tokyo Science Museum (Mr. Hirase's collection). 29×11.5 mm.

Fig. 8. *Nassarius* (*Niotha*) *gemmulatus* (LAMARCK), 27.6×16.3 mm.

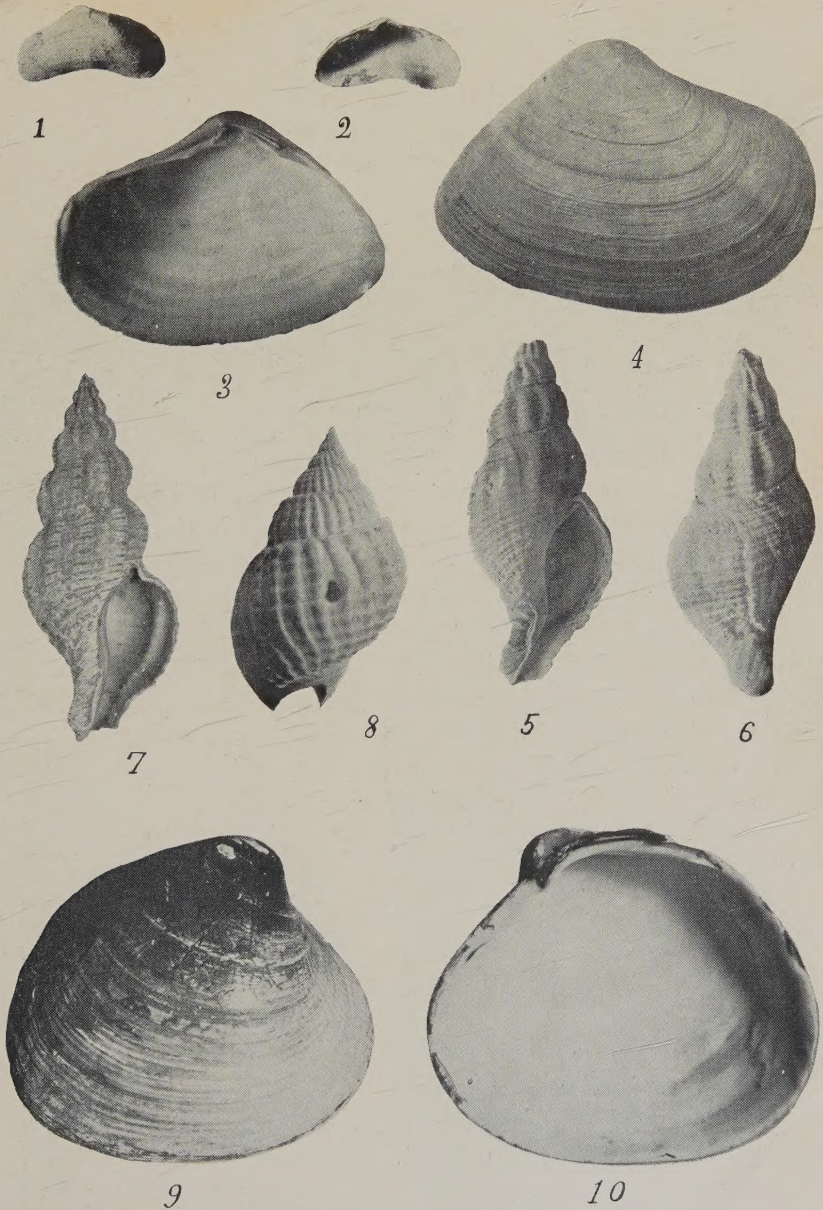
1. 關東地方洪積統産の二、三の軟體動物 (摘要)

大炊御門經輝

英文欄に記載した四種の中 *Mysella paula* (A. ADAMS) は鈴木、高井兩學士に依る千葉縣多古町附近の洪積層からの報告があり、*Nassarius gemmulatus* (LAMARCK) は神奈川縣長井町大木根から鈴木學士に依つて報告されてゐるが、他の二種 *Mactra dolabrata* REEVE 及び *Searlesia simosensis* n. sp. は未だ關東地方の洪積層から知られてゐなかつた。

Searlesia simosensis は *S. fuscolabiata* (SMITH) に比べて螺層はあまり脹れず、殻口は狭い。*S. hokkaidonis* (PILSBRY) に似てゐるが殻は該種の様に細長くなく、螺塔は低い。*S. japonica* YOKOYAMA は本種より殻が頭丈で、螺狀彫刻が一層顯著である。

S. simosensis を除いた他の三種は何れも現生種で、特に *N. gemmulatus* (LAMARCK) の分布は廣く珍らしいものではないが、關東地方の洪積層の化石では稀な方である。



Figs. 1,2 *Mysella paula* (A. ADAMS). Figs. 3,4. *Mactra* (*Mactrinula*) *dolabrata* REEVE. Figs. 5,6 *Searlesia simosensis*. OINOMIKADO n. sp. Fig. 7 *Searlesia fuscolabiata* (SMITH). Fig. 8 *Nassarius* (*Niotha*) *gemmulatus* (LAMARCK). Figs. 9, 10. *Serripes notabilis* SOWERBY.



Figs. 1,2. *Serripes laparousii* (Deshayes). Figs. 3-6. *Serripes yokoyamai* ÔTUKA n. sp.

2. *Serripes* in Japan

By

Yanosuke OTUKA

There are 7 species of *Serripes* in Japan. *Serripes groenlandicus* (BRUGUIÈRE), the genotype of *Serripes* BECK 1814, was reported by SCHRENCK from Hakodate, northern Japan. Since then two other species of *Serripes* have been reported from northern Japan and Japan Sea, namely, *Serripes lapereusii* (DESHAYES) and *Serripes notabilis* SOWERBY.

These three species are now living in the seas near Japan. Prof. M. YOKOYAMA, who has contributed much to our knowledge of Japanese palaeoconchology, described four fossil *Serripes* from the Japanese Neogene. These species were originally described under the generic names "*Cardium*" and "*Mastra*." T. KURODA described a *Serripes* from the Middle Neogene of Sinano.

Recently T. SUGAI found a *Serripes* in the Miocene formation of Hukusima prefecture, Japan. This species is new.

The following is a list of these species of *Serripes* in Japan, together with their descriptions.

Genus *Serripes* BECK in GOULD, Invert. Mass. 1841.

1841 *Serripes* (BECK MS.) GOULD, Invert. Mass., p. 93.

"Valve smooth mesially, radially striate towards the ends; cardinal teeth obsolete; pallial line truncate behind; foot geniculate, compressed, serrate on the edge below (DALL, 1900)."

1. *Serripes groenlandicus* (BRUGUIÈRE)

(1789 *Cardium groenlandicum*, CHEMNITZ, BRUGUIÈRE, Encyl. Meth. Vers., 1, pt. 1, p. 222.)

(1792 *Cardium groenlandicum*, GMELIN in LINNAEUS, Syst. Nat., 13, p. 3252.)

(1841 *Serripes grönlandicus*, BECK, in GOULD, Invert. Mass., p. 93.)

1924 *Serripes groenlandicus*, OLDROYD, Stanford Univ. Publ. Geol. Sci. 1, 1, p. 145, Pl. 8, fig. 3.

1929 *Cardium groenlandicum*, YOKOYAMA, Jour. Fac. Sci, Imp. Univ Tokyo, (ii), 2, 9, p. 390, pl. 73, fig. 3.

- 1931 *Serripes grönländicus* (BRUGUIÈRE), GRANT and GALE, San Diego Soc. Nat. Hist. Mem. **1**, p. 314.
- 1933 *Serripes groenlandicus*, NOMURA, Jap. Journ. Geol. Geogr. **11**, 112, p. 6.
- Geol. age.—Miocene?-Recent.
- Geogr. distr.—Arctic Sea; Quebec, Alaska; Hakodate, Japan.

2. *Serripes laperosii* (DESHAYES)

Pl. II, fig. 1.

- (1839 *Cardium lapercusii* DESHAYES, Rev. Zool. Soc., Cuvierienne, p. 360.)
- 1921 *Serripes laperosii*, DALL, Trans. Wagner Free Inst. Sci., **3** pp. 1112, 1113.
- 1900 *Serripes lapercusii*, DALL, U. S. National Mus. Bull. **112**, p. 40.
- 1931 *Serripes lapercusii*, GRANT and GALE, Mem. San Diego Soc. Nat. Hist. **1**, p. 314.

Geol. age.—Pleistocene-Recent.

Geogr. distr.—Bering Strait to Hokkaido, Japan; Sitka, Alaska.

3. *Serripes notabilis* SOWERBY

Pl. 1, figs. 9, 10.

- 1915 *Serripes notabilis* SOWERBY, Ann. Mag. Nat. Hist. **8**, 16, p. 169, Pl. 10, fig. 9.
- 1928 *Mactra makiyamae* YOKOYAMA, Jour. Fac. Sci. Imp. Univ. Tokyo, (ii), **2**, pt. 7, p. 360, Pl. 49, fig. 3.
- 1934 *Serripes notabilis*, HIRASE, Collection Japanese Shells, Pl. 31, fig. 1.

The fossil species of YOKOYAMA may be identical with *Serripes notabilis* SOWERBY. The latter species, however, has a more elongate shell and roundly arcuate ventral margin and distinct radiating ribs on the middle part of the shell surface.

Geol. age.—Lower Pliocene-Recent.

Geogr. distr.—Higasiyama, Niigata prefecture; Japan sea.

4. *Serripes pauperculus* (YOKOYAMA)

- 1923 *Cardium pauperculus* YOKOYAMA, Jap. Journ. Geol. Geogr., **2**, p. 6, Pl. 1, fig. 2.
- 1931 *Serripes pauperculus*, KURODA in HOMMA's Geology of Central Shinano, pt. 2, p. 55 (in Japanese).

This fossil species has a more acute apex and a more angulated postero-ventral margin than *Serripes notabilis* Sowerby.

Geol. age.—Middle Neogene (or Upper Miocene).

Geogr. distr.—Simane prefecture.

5. *Serripes fujinensis* (YOKOYAMA)

- 1923 *Cardium fujinensis* YOKOYAMA, Jap. Journ. Geol. Geogr., **2**, p. 6, Pl. 2, fig. 2.

1931 *Serripes fujinensis*, KURODA in HOMMA's Geology of Central Sinano, pt. 2, p. 55 (in Japanese).

This fossil species has a more inequilateral and more convex shell than that of *Serripes groenlandicus* (BRUGUIÈRE). *Serripes laperousii* (DESHAYES) has a large shell with straight postero-dorsal margin.

Geol. age.—Miocene of Simane prefecture.

Geogr. distr.—Simane prefecture.

6. *Serripes yokoyamai* OTUKA n. sp.

Pl. II, figs. 3, 4; 5, 6.

One left valve and some incomplete specimens were examined. The shell is large, convex, roundly trigonal, inequilateral, rounded in front, and vertically truncated behind, with broadly rounded ventral margin. The surface of the shell where its material is preserved shows numerous blunt radiating ribs, distinct in the anterior part, but indistinct in the middle, and probably also in the posterior part. The beak is rather swollen, pointed and curved forward, striated in the middle part of the dorsal margin.

No 1. Height 70 mm, length 77 mm, depth 23 mm.

No. 2. Height 64 mm, length 71 mm, depth 18.5 mm.

Type locality: Miocene formation, Hagino, Yamanogo-mura, Yamagori, Hukusima prefecture. In light gray tuffaceous sand.

Holotype (No. 2531) and Cotype (No. 2532) are stored in the Earthq. Res. Inst. Imp. Univ. Tokyo.

Although this species is closely allied to *Serripes notabilis* SOWERBY, the umbone of the former is situated at about the middle part of the dorsal margin, while the latter has a more inequilateral shell, the umbo of the latter species being situated nearly in the anterior third of the shell length.

Phylogenically, *Serripes yokoyamai* OTUKA may be closely connected with *Serripes notabilis* SOWERBY.

7. *Serripes* sp.

1931 *Serripes* sp. KURODA in HOMMA's Geology of Central Sinano, pt. 2, pp. 54, 55, Pl. 5, fig. 31 (in Japanese).

Geol. age.—Middle Neogene (Lower Pliocene?)

Geogr. distr.—Nagano prefecture.

Explanation of Plate.

- Pl. I, figs. 9, 10. *Serripes notabilis* SOWERBY (Living; Japan Sea) (No. 394).
 Pl. II, figs. 1, 2. *Serripes lapereusii* (DESHAYES) (Living; Is. Attu, Aleutian) (No. 1663).
 Pl. II, figs. 3, 4. *Serripes yokoyamai* OTUKA (Holotype) (No. 2531).
 Pl. II, figs. 5, 6. *Serripes yokoyamai* OTUKA (Cotype). (No. 2532).

2. 日本産 *Serripes* (摘要)

大塚 彌之助

日本産 *Serripes* 属は全體で 7 種知られてゐる。即ち

- (1) *Serripes groenlandicus* (BRUGUIÈRE) (北海道, 北極洋, クエベック)
- (2) *Serripes lapereusii* (DESHAYES) (北部日本, ベーリング海峡, アラスカ)
- (3) *Serripes notabilis* SOWERBY (日本海現生, 新潟縣新統)
- (4) *Serripes pauperculus* (YOKOYAMA) (島根縣中新統)
- (5) *Serripes fujinensis* (YOKOYAMA) (島根縣中新統)
- (6) *Serripes yokoyamai* OTUKA (福島縣中新統)
- (7) *Serripes* sp. of KURODA (信濃中部第三系)

上記の内 (1), (2), (3) は現生種で, 何れも化石としても報ぜられてゐる。(4), (5), (6)(7) は第三紀の化石としてのみ知られてゐる。(6) は新種で, (7) は稍と不完全な標本である。(4), (5), は横山博士の記載にかゝるもので, それらは *Cardium* 属及び *Mactra* 属として報ぜられてゐる。(7) は黒田徳米氏の報ぜられたもので, 新種の疑がある。(6) は最近須貝貫二氏が福島縣耶麻郡山ノ郷村荻野に露出する灰色凝灰質砂岩(通稱綠色凝灰岩と稱してゐるが眞の意味の綠色凝灰岩ではない)から採集されたもので, 之は新種の様に見える。この新種は次の様なものである。

Serripes yokoyamai OTUKA (新種) (Pl. II, figs. 3, 4, 5, 6) 標本は一左殻片と數個の不完全な殻片とである。

殻は大きく, 膨り, 圓き三角形を呈し, 不等側, 前端圓く, 後端は縦に截られてゐる。腹縁は廣く圓く彎曲してゐる。殻の表面は, 殻質の保存されてゐるところは, 多くの鈍い放射狀の肋を有し之は殻の表面の前部では明であるが, 中央部又は後部では不明瞭である。殻頂は稍と膨らみ前方へ向つて彎曲し, 背縁の中央部に位してゐる。第 1 標本高さ 70 mm, 長さ 77 mm, 厚さ(一殻片) 23 mm, 第二標本高さ 64 mm, 長さ 71 mm, 厚さ(一殻片) 18.5 mm。

Serripes yokoyamai OTUKA は *Serripes notabilis* SOWERBY (Pl. I, figs. 9, 10.) とその外型極めて類似するが, 前者の殻頂は背縁部の中央に位するのに, 後者のものは前方に偏し, 背縁の 3 分の 1 前方にある。

3. *A Pleistocene Flora of Japan as an Indicator of Climatic Condition*

By

SEIDÔ ENDÔ

(Contribution from the Institute of Geology and Palaeontology,
Tôhoku Imperial University; Sendai)

Siobara is one of the famous hot spring and summer resorts in Japan, lying a little north of Nikko and within easy reach of the Nisi-Nasuno station on the Tôhoku main railway line. It is visited every summer and autumn by several thousands of tourists. It lies at nearly lat. N. 37°.

The geology of the district was early studied by Mr. N. KANEHARA and lately by Professor H. YABE¹⁾, and then by Messers R. TAYAMA and H. NIINO more in detail. It is a depression in the northern part of the Simotuke mountainland; it subsided late in the Tertiary and was subsequently filled with volcanic materials from two volcanoes, Siobara (older) Takahara-yama, (younger) rising within the depression.

A lake was there once brought to existence between the high wall at the north and the earliest ejecta from the Siobara volcano from south; in a certain horizon of fine lacustrine deposits mostly of volcanic origin myriads of plant leaves were buried. These fossil leaves are in excellent preservation, and now dug out and sold by a ground owner to the visitors of the spas. They are well known under the name Konoha-isi, "Konoha" meaning plant leaves and "Isi" stone. Only a few of them were examined by Prof. E. G. NATHORST²⁾ of Sweden half a century ago but no further palaeo-

1) YABE, H. "Siobara volcano and its relation to geological structure." *Proc. Japan. Assoc. Adv. Sci.* **4**, (1928), pp. 302-317, (in Japanese).

2) NATHORST, A. G.: Zur fossilen Flora Japans. Pal. Abhandl., heraus. von DAMES und KAYSER, **4**, (1888), pp. 225-239, Pls. 25, 26.

botanical has ever been made.

The geological history of the district almost begins with the deposition of liparitic green tuff formation called Hukuwata group by NIINO³⁾ upon an eroded surface of younger Palaeozoic rocks, sandstone, shale, quartzite, chert and *Fusulina*-limestone; the Hukuwata group is at least partly marine in origin, intercalating several layers with marine shells, and is succeeded upwards by Kanomata-gawa group consisting of sandstone and tuff, with a rich shallow sea molluscan fauna⁴⁾ of which the most common forms are *Cardium shiobarense* YOKOYAMA and *Pecten kaneharai* YOKOYAMA. Subsequent marine regression built a series, the Sekiya group, of conglomerate, shale and pisolitic tuff, with interbedded lignite seams and bearing fossil plants such as *Sequoia sempervirens* ENDL. fossilis Endô, *Acer Nordenskiöldi* Nathorst and *Diervilla* sp.⁵⁾, etc. After a crustal deformation of these three Tertiary formations as shown by a number of folds and faults, the land as in other regions of Japanese Islands received planation or extensive abrasion, which gave rise to an even land surface taken by Prof. YABE as marking the boundary plane between Tertiary and Pleistocene deposits. The next event in the Siobara district is the formation of depression within which the two volcanoes of Siobara and Takahara-yama were built and gave rise to the fossil lake stated afore and to a series of the lacustrine sediments called the Siobara group. Several terraces within the Siobara district and along the eastern border of the Simotuke mountainland as well as those of the Kwantô basin are indicators of general uplift of the whole land in the subsequent time; perhaps very early in this stage the lake had its water drained by the present Hôki-gawa and was finally brought to extinction.

The lacustrine deposits of the fossil lake are especially thin-layers where the fossil leaves are buried, and the feature of their preservation is such to lead us to infer their derivation from places near and not remote from the lake. The deposits are partly diatomaceous.

3) NIINO, H. "Geology of Siobara district", *Graduate thesis of the Institute of Geology and Palaeontology, Tôhoku Imperial University*, (1930) MS. (in Japanese.)

4) YOKOYAMA, M. "Tertiary mollusca from Shiobara in Shimotsuke." *Jour. Fac. Sci. Imp. Univ. Tokyo*, [ii], II, 1, 4 (1926), pp. 127-133, Pls. 16-20.

5) YABE, H.: *Op cit.*, (1928), p. 306.

The present contribution was based on several hundred specimens of the fossil plants from the Siobara group, untirely sampled by Prof. YABE and also by me during a long period of years; the type specimens are all stored in the Institute of Geology and Palaeontology, Tôhoku Imperial University, Sendai.

The Siobara Flora

So large a proportion of these fossil plants from the Siobara plant beds belong to genera and species previously unrecorded in palaeontological literature, that it makes comparison with any fossil flora almost impossible or at least worthless. In consequence materials for comparison were always sought after in herbaria of living plants, and in the course of my present study, it was found necessary to make rich collections of living tree leaves from various parts of Japan, since in certain cases the herbaria for botanists proved insufficient for the present purpose. The collecting and examining of the fossil materials and living ones for comparison took me about ten years, as the progress of my work was much hindered by my professional business as a teacher; during this long period living plants were collected by myself from various parts of Honsyû, Sikoku, Hokkaidô, Saghalin (Japanese as well as Russian), Korea, China, and also in certain limited parts of North America.

The sound basis for distinguishing plant species on folial character only was sometimes questioned by botanists; but, my belief is different and I am now almost fully confident of the belief. Indeed, there are simple and small leaves of different plants having similar aspect as the leaves of many shrubs and herbs are; but in the leaves of dicotyledonous trees, either palmately lobed or bearing complex duplicate-serration, species can be definitely discriminated almost without any danger.

As already stated, NATHORST⁶⁾ described in 1888, 15 species of plants from the Siobara plant beds which he then assigned to the younger Pliocene, saying "Sollte es sich aber herausstellen, dass die Mogi-Flora Altpliocän ist, so dürften wohl die pflanzenführenden Ablagerungen von Siobara, Yokohama und wohl auch von Sado jungpliocänen Alters sein." Our consideration on the geological

6) NATHORST, A. G. (1888), *Op. cit.* p. 49.

age of the fossil flora will be given in the next chapter.

Species then described by NATHORST are as follows:

- | | |
|---|---|
| 1. <i>Thuites</i> sp. | 9. <i>Fagus japonica</i> MAXIM. |
| 2. <i>Betula alba</i> L. | 10. <i>Cercidiphyllum japonicum</i> S. et Z. |
| 3. <i>Betula sublentia</i> NATHORST | 11. <i>Actinidiophyllum</i> sp. |
| 4. <i>Alnus</i> sp. | 12. <i>Tilia</i> sp. (cfr. <i>T. cordata</i> MILL.) |
| 5. <i>Carpinus subcordata</i> NATHORST | 13. Cfr. <i>Acer Nordenskiöldi</i> NATHORST |
| 6. <i>Quercus crispula</i> BL. | 14. <i>Acer?</i> sp. |
| 7. <i>Quercus</i> sp. | 15. <i>Myriophyllum</i> sp. |
| 8. <i>Fagus sylvatica</i> L. var. <i>asiatica</i> DC. | |

Some of the specific identification by NATHORST are questionable. For instance, his *Actinidiophyllum* is quite similar to our *Stewartia pseudocamellia* MAXIM., and *Thuites* sp. may possibly be our *Thuja japonica* MAXIM., while *Fagus sylvatica* var. *asiatica* is synonymous with our *F. crenata* BL. *Betula sublentia* is another doubtful species; his material figured is too incomplete and too fragmental for erecting a new species. *Betula alba* is closely allied to *B. japonica* SIEB.

The present material is considerably richer, and the species distinguished of it are listed below (Table 1); most of them are trees now common in mountainlands of Honsyû and in Hokkaidô

Table 1.

Components of the Siobara Flora with the Geographical
Distribution of Its Existing Species.

(The figures of the first column indicate climatic forest zones⁷⁾ of Japan; namely,

- 1 —Species growing in the frigid forest zone only.
- 1* —Species growing in the frigid and cold temperate forest zones.
- 1** —Species growing in the frigid, cold temperate and warm temperate forest zones.
- 2 —Species growing in the cold temperate forest zone only.
- 2* —Species growing in the cold temperate and warm temperate forest zones.

| | Climatic forest zones | Kurile Is. | Karakuto | Hokkaidô | Northern Honsyû | Central Honsyû | Southern Honsyû | Shikoku | Kyûsyû | Ryûkyû Is. | Taiwan |
|--------------------------------------|--------------------------|------------|----------|----------|--------------------|-------------------|--------------------|---------|--------|------------|--------|
| <i>Aspidium</i> sp. | | — | — | — | + | + | + | + | + | — | — |
| <i>Davallia bullata</i> WALL. | | — | — | — | + | + | + | + | + | — | + |
| <i>Dryopteris miqueliana</i> C. CHR. | | — | — | + | + | + | + | + | — | — | — |
| <i>Dryopteris</i> sp. | | — | — | — | — | — | — | — | — | — | — |

7) HONDA, S.: The forest zones of Japan (1912), (in Japanese).

| | Climatic forest zones | Kurile Is. | Karakuto | Hokkaidō | Northern Honsyū | Central Honsyū | Southern Honsyū | Shikoku | Kyūshū | Ryūkyū Is. | Taiwan |
|---|--------------------------|------------|----------|----------|--------------------|-------------------|--------------------|---------|--------|------------|--------|
| <i>Woodsia polystichoides</i> EAT. | | + | + | + | + | + | + | - | + | - | - |
| <i>Woodsia manchuriensis</i> HOOK. | | - | - | + | + | + | + | - | + | - | - |
| <i>Taxus cuspidata</i> S. et Z.? | 1* | + | + | + | + | + | + | + | - | - | + |
| <i>Picea</i> sp.? | | - | - | - | - | - | - | - | - | - | - |
| <i>Pinus pumila</i> REGEL? | 1* | + | + | + | + | - | - | - | - | - | - |
| <i>Thuja japonica</i> MAXIM. | 2 | - | - | - | + | + | - | - | - | + | - |
| <i>Sasa borealis</i> MAKINO et SHIBATA? | | - | - | + | + | + | + | - | + | - | - |
| <i>Salix</i> sp. | | - | - | - | - | - | - | - | - | - | - |
| <i>Juglans Sieboldiana</i> MAXIM. | 1* | - | + | + | + | + | + | + | + | - | - |
| <i>Juglans</i> sp. | | - | - | - | - | - | - | - | - | - | - |
| <i>Pterocarya</i> sp. | | - | - | - | - | - | - | - | - | - | - |
| <i>Alnus incana</i> WILLD. var. <i>sibirica</i> SPACH. | 1** | - | - | + | + | + | + | - | + | - | - |
| <i>Alnus firma</i> S. et Z. var. <i>Sieboldiana</i> WINKLE | 2* | - | - | + | + | + | + | - | + | - | - |
| <i>Alnus Maximowiczii</i> CALL. | 1* | + | + | + | + | + | - | - | - | - | - |
| <i>Alnus pendula</i> MATSUM. | 1** | - | - | + | + | + | - | - | - | - | - |
| <i>Betula corylifolia</i> REGEL et MAXIM.? | 1* | - | - | - | + | + | - | - | - | - | - |
| <i>Betula Ermanii</i> CHAM. | 1 | - | + | + | + | + | + | + | - | - | - |
| <i>Betula japonica</i> SIEB. | 1 | + | + | + | + | + | - | - | - | - | - |
| <i>Betula Maximowicziana</i> REGEL. | 1* | - | - | + | + | + | - | - | - | - | - |
| <i>Betula Schmidtii</i> REGEL. | 1* | - | - | - | + | + | - | - | - | - | - |
| <i>Betula ulmifolia</i> S. et Z. | 1* | - | - | - | + | + | + | + | + | - | - |
| <i>Betula</i> sp. | | - | - | - | - | - | - | - | - | - | - |
| <i>Carpinus cordata</i> BL. | 2* | - | - | + | + | + | + | + | + | - | - |
| <i>Carpinus carpinoides</i> MAKINO. | 2* | - | - | - | + | + | + | + | + | - | - |
| <i>Carpinus subcordata</i> NATHORST. | | - | - | - | - | - | - | - | - | - | - |
| <i>Castanea crenata</i> S. et Z. | 2* | - | - | + | + | + | + | + | + | - | - |
| <i>Fagus crenata</i> BL. | 2 | - | - | + | + | + | + | - | + | - | - |
| <i>Fagus japonica</i> MAXIM. | 2 | - | - | - | + | + | + | - | - | - | - |
| <i>Quercus crispula</i> BL. | 1* | + | + | + | + | + | + | - | + | - | - |
| <i>Quercus acutissima</i> CARR. | 2* | - | - | - | + | + | + | + | + | - | - |
| <i>Celtis Bungeana</i> BL. var. <i>jessoensis</i> MIYABE et KUDO | 2 | - | - | + | + | + | + | + | - | - | - |
| <i>Ulmus japonica</i> SARG. | 1* | + | + | + | + | + | + | - | + | - | - |
| <i>Cercidiphyllum japonicum</i> S. et Z. | 2 | - | - | + | + | + | + | + | - | - | - |
| <i>Clematis apiifolia</i> DC. | | - | - | - | + | + | + | + | + | + | - |
| <i>Ranunculus acris</i> var. <i>japonica</i> MAXIM. | | + | + | + | + | + | + | + | + | + | + |
| <i>Ranunculus aquatilis</i> L.? | | - | + | + | + | + | - | - | - | - | - |
| <i>Magnolia obovata</i> THUNB. | 2* | - | - | + | + | + | + | - | + | + | - |
| <i>Magnolia</i> sp. | | - | - | - | - | - | - | - | - | - | - |
| <i>Hydrangea hirta</i> S. et Z. | 2 | - | - | - | + | + | + | + | - | - | - |
| <i>Hydrangea paniculata</i> SIEB. | 1* | - | + | + | + | + | + | + | + | - | - |

| | Climatic forest zones | Kurile Is. | Karakuto | Hokkaidô | Northern Honsyû | Central Honsyû | Southern Honsyû | Sikoku | Kyûsyû | Ryûkyû Is. | Taiwan |
|--|--------------------------|------------|----------|----------|--------------------|-------------------|--------------------|--------|--------|------------|--------|
| <i>Schizophragma hydrangeoides</i> S. et Z. | | — | — | + | + | + | + | + | + | + | — |
| <i>Hamamelis japonica</i> S. et Z. | 2 | — | — | + | + | + | + | + | + | + | — |
| <i>Amelanchier asiatica</i> ENDL. | 2* | — | — | — | + | + | + | + | + | — | — |
| <i>Crataegus</i> sp. | | — | — | — | — | — | — | — | — | — | — |
| <i>Malus Zumi</i> MATSUM. | | — | — | + | + | — | — | — | — | — | — |
| <i>Micromeles alnifolia</i> KOEHNE | 1* | — | — | + | + | + | + | — | + | — | — |
| <i>Micromeles japonica</i> KOEHNE | 1* | — | — | + | + | + | + | + | + | — | — |
| <i>Prunus Maximowiczii</i> RUPR. | 1* | + | + | + | + | + | + | + | — | — | — |
| <i>Prunus</i> sp. | | — | — | — | — | — | — | — | — | — | — |
| <i>Sorbus gracilis</i> C. KOCH | | — | — | — | — | + | + | + | + | — | — |
| <i>Sorbus japonica</i> KOEHNE | 1* | + | + | + | + | + | + | + | + | — | — |
| <i>Sorbus rufo-ferruginea</i> KOIDZ. | 2 | — | — | — | — | + | — | — | — | — | — |
| <i>Sorbus</i> sp. | | — | — | — | — | — | — | — | — | — | — |
| <i>Robinia</i> ? sp. | | — | — | — | — | — | — | — | — | — | — |
| <i>Phellodendron amurense</i> RUPR.? | 1* | — | + | + | + | + | + | + | — | — | — |
| <i>Ilex geniculata</i> MAXIM. | | — | — | — | + | + | + | + | + | — | — |
| <i>Acer carpinifolium</i> S. et Z. | | — | — | + | + | + | + | + | + | — | — |
| <i>Acer crataegifolium</i> S. et Z. | | — | — | — | + | + | + | + | + | — | — |
| <i>Acer diabolicum</i> BL. | | — | — | + | + | + | + | + | + | — | — |
| <i>Acer eupalmatum</i> (GR. V. SCHW.) KOIDZ. | 2 | — | — | — | + | + | + | + | + | — | — |
| <i>Acer euseptenlobum</i> (GR. V. SCHW.) KOIDZ. | 2 | — | — | — | + | + | — | — | — | — | — |
| <i>Acer japonicum</i> THUNB. | 2 | — | — | + | + | + | — | — | — | — | — |
| <i>Acer micranthum</i> S. et Z. | 2 | — | — | — | + | + | + | + | + | — | — |
| <i>Acer Miyabei</i> MAXIM. | 1* | — | — | + | + | — | — | — | — | — | — |
| <i>Acer Nordenskiöldi</i> NATHORST? | | — | — | — | — | — | — | — | — | — | — |
| <i>Acer nikoense</i> MAXIM.? | | — | — | — | — | — | — | — | — | — | — |
| <i>Acer pictum</i> THUNB. | 1** | — | — | + | + | + | + | + | — | — | — |
| <i>Acer rufinerve</i> S. et Z. | 2 | — | — | + | + | + | + | + | + | — | — |
| <i>Acer Sieboldianum</i> MIQ. | | — | — | + | + | + | + | + | + | — | — |
| <i>Acer Tschonoskii</i> MAXIM | 1* | — | — | — | + | + | — | — | — | — | — |
| <i>Acer</i> ? sp. | | — | — | — | — | — | — | — | — | — | — |
| <i>Meliosma myriantha</i> S. et Z. | 2 | — | — | — | + | + | + | + | + | — | — |
| <i>Berchemia racemosa</i> S. et Z. | 2 | — | — | + | + | + | + | — | + | + | + |
| <i>Rhamnus</i> sp. | | — | — | — | — | — | — | — | — | — | — |
| <i>Vitis flexuosa</i> THUNB. | | — | — | — | + | + | + | — | + | — | + |
| <i>Tilia distans</i> NATHORST? | | — | — | — | — | — | — | — | — | — | — |
| <i>Tilia Miyabei</i> JACK. | 2 | — | — | + | + | — | — | — | — | — | — |
| <i>Tilia japonica</i> SIMK. | 1* | — | — | + | + | + | + | + | — | — | — |
| <i>Tilia</i> sp. | | — | — | — | — | — | — | — | — | — | — |
| <i>Actinidia polygama</i> PLANCH | | — | + | + | + | + | + | — | + | — | — |
| <i>Stewartia pseudo-Camellia</i> MAXIM | 2* | — | — | — | + | + | + | + | + | — | — |
| <i>Myriophyllum spicatum</i> L.? | | — | + | + | + | + | + | — | + | + | + |

| | Climatic forest zones | Kmle Is. | Karakuto | Hokkaidô | Northern Honsyû | Central Honsyû | Southern Honsyû | Shikoku | Kyûsyû | Ryûkyû Is. | Taiwan |
|--|--------------------------|----------|----------|----------|--------------------|-------------------|--------------------|---------|--------|------------|--------|
| <i>Araliphyllum Naumanni</i> NATHORST? | | — | — | — | — | — | — | — | — | — | — |
| <i>Hedera</i> ? sp. | | — | — | — | — | — | — | — | — | — | — |
| <i>Cynoxylon japonica</i> NAKAI | 2* | — | — | — | + | + | + | + | + | — | — |
| <i>Cornus controversa</i> HEMSL. | 2 | — | — | + | + | + | + | + | + | — | — |
| <i>Clethra barbinervis</i> S. et. Z. | 2* | — | — | + | + | + | + | + | + | — | — |
| <i>Rhododendron degronianum</i> CARRIÈRE | | | | | | | | | | | |
| f. <i>spontaneum</i> NAKAI | 1* | — | — | — | + | + | — | — | — | — | — |
| <i>Rhododendron dilatatum</i> MIQ. | 2* | — | — | + | + | + | + | — | + | — | — |
| <i>Rhododendron globrius</i> NAKAI | | — | — | — | + | + | — | — | — | — | — |
| <i>Rhododendron</i> sp. | | — | — | — | — | — | — | — | — | — | — |
| <i>Rhododendron</i> sp. | | — | — | — | — | — | — | — | — | — | — |
| <i>Meisteria campanulata</i> NAKAI | 2 | — | — | + | + | + | + | + | + | — | — |
| <i>Tripetaleia bracteata</i> MAXIM. | 2 | — | — | + | + | + | — | — | — | — | — |
| <i>Tripetaleia paniculata</i> S. et Z. | 2 | — | — | + | + | + | + | — | + | — | — |
| <i>Xolisma elliptica</i> NAKAI | | — | — | — | + | + | + | + | + | — | — |
| <i>Palura paniculata</i> NAKAI | 2 | — | — | + | + | + | + | + | + | — | — |
| <i>Styrax obassia</i> S. et Z. | 2 | — | — | + | + | + | + | + | + | — | — |
| <i>Fraxinus longicuspis</i> S. et Z. | 2 | — | — | + | + | + | + | — | + | — | — |
| <i>Viburnum furcatum</i> BL. | 1* | — | + | + | + | + | + | + | + | — | — |
| <i>Viburnum urceolatum</i> S. et Z. | 2 | — | — | — | + | + | + | + | + | — | — |
| <i>Viburnum Wrightii</i> MIQ. | | — | — | + | + | + | + | + | + | — | — |
| <i>Phyllites</i> sp. (1) cfr. <i>Kalopanax ricinifolium</i> MIQ. | | | | | | | | | | | |
| <i>Phyllites</i> sp. (2) cfr. <i>Betula nikoensis</i> KOIDZ. | | | | | | | | | | | |
| <i>Phyllites</i> sp. (3) cfr. <i>Trochodendron aralioides</i> S. et Z. | | | | | | | | | | | |
| <i>Phyllites</i> sp. (4) | | | | | | | | | | | |
| <i>Phyllites</i> sp. (5) | | | | | | | | | | | |
| <i>Phyllites</i> sp. (6) | | | | | | | | | | | |
| <i>Phyllites</i> sp. (7) | | | | | | | | | | | |
| <i>Phyllites</i> sp. (8) | | | | | | | | | | | |
| <i>Phyllites</i> sp. (9) | | | | | | | | | | | |

Table 2.

Components of Siobara Flora, Classified.

Embryophyta, Asiphonogama.

Pteridophyta :

Filicales ; Polypodiaceae, 6*

Embryophyta, Siphonogama.

Gymnospermae :

Coniferales ; Taxaceae, 1. Pinaceae, 2. Cupressaceae, 1.

Angiospermae :

Monocotyledonae ; Glumiflorae ; Gramineae, 1.

* Number of species.

Dicotyledonae ;

| | | |
|------------------------|-------------------------------|----------------------------|
| <i>Salicales</i> : | <i>Salicaceae</i> , 1. | |
| <i>Juglandales</i> : | <i>Juglandaceae</i> , 3. | |
| <i>Fagales</i> : | <i>Betulaceae</i> , 24. | <i>Fagaceae</i> , 5. |
| <i>Urticales</i> : | <i>Ulmaceae</i> , 2. | |
| <i>Ranales</i> : | <i>Cercidiphyllaceae</i> , 1. | <i>Ranunculaceae</i> , 3. |
| | <i>Magnoliaceae</i> , 2. | |
| <i>Rosales</i> : | <i>Saxifragaceae</i> , 3. | <i>Hamamelidaceae</i> , 1. |
| | <i>Rosaceae</i> , 11. | <i>Leguminosae</i> , 1. |
| <i>Geraniales</i> : | <i>Rutaceae</i> , 1. | |
| <i>Spindales</i> : | <i>Aquifoliaceae</i> , 1. | <i>Aceraceae</i> , 15. |
| | <i>Sabiaceae</i> , 1. | |
| <i>Rhamnales</i> : | <i>Rhamnaceae</i> , 2. | <i>Vitaceae</i> , 1. |
| <i>Malvales</i> : | <i>Tiliaceae</i> , 4. | |
| <i>Parietales</i> : | <i>Dilleniaceae</i> , 1. | <i>Theaceae</i> , 1. |
| <i>Myrtiflorae</i> : | <i>Halorrhagaceae</i> , 1. | |
| <i>Umbelliflorae</i> : | <i>Araliaceae</i> , 2. | <i>Cornaceae</i> , 2. |
| <i>Ericales</i> : | <i>Clethraceae</i> , 1. | <i>Ericaceae</i> , 9. |
| <i>Erenales</i> : | <i>Symplocaceae</i> , 1. | <i>Styracaceae</i> , 1. |
| <i>Contortae</i> : | <i>Oleaceae</i> , 1. | |
| <i>Rubiales</i> : | <i>Caprifoliaceae</i> , 3. | |

Besides 9 species of unknown order, family and genus.

As shown in the foregoing list (Table 2), this flora consists of 115 species in 58 genera, 35 families and 20 orders, aside 9 of unknown nature.

Most of them belong to deciduous trees of *Dicotyledonae*, *coniferales* being somewhat and *Monocotyledonae* extremely rare! Of *Monocotyledonae* we have only one or two doubtful materials.

Filicales is rather common and all examined by me belong to the single family, *Polypodiaceae*. Waterplants are not commonly preserved without *Myriophyllum* and *Diatoms*.

In general composition, we have here a cold temperate meso-phytic flora.

Geological Age of the Siobara Flora.

Whereas a Pliocene flora usually consists of (a) species still living in the vicinity, (b) extinct species, in a considerable percentage, and (c) conformable species in remote regions, the Siobara flora has no conformable species in remote regions such as *Sequoia*, *Taxodium*, *Glyptostrobus*, *Juglans*, *Liquidambar*, *Liriodendron* and *Fagus ferruginea* Arr., etc., which were common and widely distributed plants during the Tertiary time over Asia (including Japan)

and Europe, and left their remains abundantly in certain Tertiary plant beds of Eurasia.⁸⁾ One explanation of the cause of the total extinction of these cosmopolitan species from the extensive area is surely that it is due to certain climatic influence of the encroaching Pleistocene ice age.

More than 90 percent of the species distinguished from the Siobara flora belong to the trees now living in Japan and most of them are those common in the present temperate and frigid forest zones of northern Honsyû and Hokkaidô. Above all, *Aceraceae*⁹⁾ and *Betulaceae* give to the flora most characteristic elements, which are rich in number both of species and individuals, and most of the remains of *Betulaceae* belong to the trees now existing in the frigid forest zone of northern Japan.

There are about 150 species recorded from the world of fossil *Acer* including some of doubtful nature; the oldest remains are from the Upper Cretaceous of western Greenland¹⁰⁾ and North America¹¹⁾, where they are extremely scanty in the number of species. First in the Lower Miocene time, *Acer* acquired predominance and is richly represented in Pliocene and Pleistocene floras. Some of the fossil and living species possess palmately

8) BOULAY, M. A.: "Flore Pliocène du Mont-Dore," (1892). ENDÔ, S.: "Cenozoic fossil plants," (1931) (in Japanese). ENDÔ, S.: "A Neogene species of *Sequoia* from Japan." *Bot. Gazette* **94** 3. (1933). ENDÔ, S.: "Supplement to the Cenozoic fossil plants" (1933), (in Japanese). ENDÔ, S.: "The butternut (*Juglans cinerea* L.) from the Upper Pliocene of Japan." *Japan. Jour. Geogr.* **11** 3-4. (1934). ENDÔ, S.: "Discovery of *Liriodendron* leaves from the Neogene of Japan." *Proc. Imp. Acad.* **10** 9. (1934). ENDÔ, S. and MORITA, H.: "Notes on the genera *Comptoniophyllum* and *Liquidambar*." *Sci. Rep. Tohoku Imp. Univ., Sendai*, (2) (Geology) **15** 2. (1932). FLORIN, R.: "Zur Kenntnis der Jungtertiären Pflanzenwelt Japans." *Kgl. Svenska Vet. Akad. Handl.*, **61** 1, (1920). MASSALONGO, A. E. and SCARABELLI, G.: "Studi sulla Flora Fossile F. Geologia Stratigrafica del Senigalliese," (1858). NATHORST, A. G.: "Contribution à la flora fossile du Japon." *Kgl. Svenska Vet. Akad. Handl.*, **20**, 2, (1883). REID, C. and REID, E.: "The Pliocene Floras of the Dutch-Prussian border." *Mitteil. Bohr. Niederlander.* **6**, (1915). SAPETA, G. DE, et MARION, A. F.: "Recherches sur les Végétaux Fossiles de Meximieux," (1876). STRAUS, A.: "Dikotyle Pflanzenreste aus dem Oberpliozän von Willershausen (Kreis Osterode, Harz) 1." *Jahrb. Preuss. Geol. Landesanst.*, Berlin, **51** I, (1930).

9) ENDÔ, S.: "Some Japanese Cenozoic plants, I. On the fossil *Acer* from the Siobara Pleistocene plant beds." *Japan. Jour. Geol. Geogr.* **11** 3-4, (1934).

10) HEER, O.: "Flora Foss. Arct." **7**, (1883), pp. 38-39, Pl. 65, figs. 1-3.

11) BERRY, E. W.: "The Flora of the Ripley Formation," *U. S. Geol. Surv. Prof. P.* **136**, (1925), pp. 66-67, Pl. 13, fig. 2.

lobed leaves and the number of lobes increases with advancing geological ages (Table 3).

According to SINNOTT and BAILEY¹²⁾, leaves of the primitive angiosperm were palmate and three lobed. This may be true; but on the other hand, the first leaves of living angiosperm seedlings and abnormal leaves of vigorous young shoots or young trees, which some-

Table 3.

| Geological age. | Number of lobes |
|------------------|---------------------|
| Upper Cretaceous | 3 |
| Eocene | 3 to 5 |
| Oligocene | 3 to 5 (rarely 7?) |
| Miocene | 3 to 7 |
| Pliocene | 3 to 7 (rarely 9) |
| Pleistocene | 3 to 11 |
| Recent | 3 to 13 (rarely 15) |

times exhibit most primitive features, are simple. LUBBOCK says¹³⁾

"The great majority of cotyledons are entire, but some are more or less lobed, and the first leaves are generally simple, or at any rate simpler than those which follow. In species with trifoliate leaves, the first leaf is generally simple. When the mature leaves are pinnate (compound), the first ones are generally trifoliate; and when the final leaves are bipinnate, the first ones are generally pinnate. In most cases, therefore, the first leaves are simpler than those which follow."

The question whether the leaves of the earliest species of *Acer* was simple or lobed is out of the scope of the present study, but it is at least certain that later the lobation of leaves increased with advancing geological ages and we see at present such multi-lobed palmate leaves as possessed by *Acer japonicum*, *A. sieboldianum*, *A. shirasawanum* and *A. circinatum*. Furthermore, palmate leaves, according to SINNOTT and BAILEY¹⁴⁾, are remarkably absent among tropical plants, while those are common among the plants growing under a temperate mesophytic environment.

While the lobed leaves of *Acer pictum* and some other species have entire margin, those of a great many species of the Pleistocene and the present northern frigid zone are margined by fine and

12) SINNOTT, E. W. and BAILEY, J. W. "Foliar evidence as to the ancestry and early climatic environment of the angiosperms." *Amer. Jour. Bot.* **2**, (1915), pp. 15-16.

13) LUBBOCK, J. A contribution to our knowledge of seedlings. **1**, (1892), pp. 20-21, 25, 40, 74-75.

14) SINNOTT, E. W., and BAILEY, J. W.: *Op. cit.*, (1915), p. 15.

relatively regularly duplicate-serrations. More in general, leaves with a duplicately-serrated margin are almost absent in woody plants of the present tropical and subtropical regions. Consequently the commonness of the *Acer* leaves, multilobed palmate and duplicately serrated along the margin, in a flora can safely be taken as a sign indicating a cold climatic condition under which it had grown.

Now, *Acer japonicum* and *A. Sieboldianum*¹⁵⁾ etc. of the Siobara flora both in possessing leaves, 9-11 lobed palmate and in being duplicately serrated along the margin, are suggestive of the Pleistocene age of the flora.

The Mogi and Amakusa floras well known by the studies of NATHORST and FLORIN¹⁶⁾ have several exotic species as *Fagus ferruginea*, *Taxodium distichum*?, *Liquidambar formosana*, *L. europaeum*, *Rhus griffithii*, *Ostrya virginiana* and *Celtis* cfr. *occidentalis* L., which do no more exist in the present Japanese Islands; these two floras are younger Pliocene according to NATHORST and FLORIN and the Siobara flora, they believe, is decidedly younger. The Pleistocene age of the Siobara plant beds was also maintained by H. YABE¹⁷⁾ from stratigraphical standpoint and on careful study of terraces, both of this district and the Kwanto basin, where marine Pleistocene deposits are well developed.

All the facts mentioned above point to the one and the same conclusion that the Siobara flora is Pleistocene in age. It seems to me, the Pleistocene and Pleiocene floras of Japan can be well defined by their floral characters, peculiar to their own and sharply discriminable one another.

Climatic Condition.

Fossil flora is undoubtedly most useful as the indicator of past climate. REID says¹⁸⁾:

"Mammals, or any warm-blooded animals, are unsafe guides: for they

15) ENDÔ, S.: "Some Japanese Cenozoic plants. I. On the fossil *Acer* from the Siobara Pleistocene plant beds." *Op. cit.* (1934), pp. 241-243.

16) NATHORST, A. G.: "Contributions à la Flore Fossile du Japon." *Kgl. Svenska Vet. Akad. Handl.*, 20, 2. (1883). FLORIN, R.: "Zur Kenntnis der Jungtertiären Pflanzenwelt Japons." *Ditto*, 21, 1, (1920).

17) YABE, H.: *Op. cit.*, (1928), p. 317.

18) REID, C. and REID, E.: *Op. cit.*, (1915), pp. 1-2.

have great power of resisting and adapting themselves to climatic changes. Closely allied species may inhabit arctic and tropical regions, and we cannot learn from any living mammal under what conditions an extinct ally may have lived. The elephant and the rhinoceros are now tropical; extinct elephants and rhinoceroses, clothed with thick fur, are found frozen up in the soil of Siberia, and were evidently adapted to an arctic climate.

The land and fresh water mollusca have proved less use than was expected. The coleoptera probably would be a very valuable group for this study, were their fossil remains less fragmentary and less difficult to collect and preserve. There remain the flowering plants and cryptogams, both of which are extremely useful."

The plants represented in the fossil flora now we concern are trees common in the temperate and frigid zones of the present Japan. The flora of Mt. Hakkôda in the most northerly part of Honsyû has lately been studied by Mr. Y. HORIKAWA¹⁹⁾, and a zone of deciduous trees closely allied to those of the Siobara flora is met with at a height at about 900m. above the sea level. On the slope of the famous Mt. Huzi (Fuji) in central Japan, the flora of which is well known to us by the excellent work of the late Professor B. HAYATA²⁰⁾, we find at about 1500m. a similar community of trees in most luxuriant growth. A few elements of the Siobara fossil flora are confined in their present distribution to the frigid forest zone, and there is none which now live only within warm temperate zone. Living trees of the dominant species of the flora, for instance, those belonging to the families *Betulaceae*, *Fagaceae* and *Rosaceae*, are the most common plants of the lowland of central Hokkaidô which is nearly on the boundary between the temperate and frigid forest zones. At the present time, the mean annual temperature of the city of Utunomiya siting on the plain nearest to Siobara differs in about 5.5° C. from that of the city of Sapporo in central Hokkaidô.

In the first coloumn on the annexed table (Table 4) are given the names of the dominant species of the Siobara fossil flora and in the second the altitude at which the living trees of these species enjoy their most luxuriant growth in the mountainlands

19) HORIKAWA, Y.: "The vegetation of Mt. Hakkoda," *Sci. Rep. Tôhoku Imp. Univ.* (4) (Biology), 5 3, (1930), pp. 555-573, Pls. 17-20.

20) HAYATA, B.: "The vegetation of Mt. Fuji." (1911), p. 29, table 23; p. 34, table 29; Map.

of central Japan²¹⁾.

Table 4.

| | |
|---|--------------|
| <i>Acer carpiniifolium</i> S. et Z. | 900....1500 |
| <i>Acer eupalmatum</i> KOIDUMI | 1500± |
| <i>Acer rufinerve</i> S. et Z. | 600....1600 |
| <i>Acer japonicum</i> THUNB. | 900....1600 |
| <i>Acer diabolicum</i> BL. | 1500± |
| <i>Acer pictum</i> THUNB. | 1500± |
| <i>Acer Tschonoskii</i> MAXIM. | 1000....1800 |
| <i>Alnus incana</i> WILLD. var. <i>sibirica</i> SPACH. | 1500± |
| <i>Alnus Maximowiczii</i> CALL. | 1600± |
| <i>Betula japonica</i> SIEB. | 1000....1600 |
| <i>Betula Ermanii</i> CHAM. | 1600± |
| <i>Betula Maximowicziana</i> REGEL. | 1400....1700 |
| <i>Betula Schmidtii</i> REGEL. | 1500± |
| <i>Carpinus cordata</i> BL. | 1500± |
| <i>Carpinus carpinoides</i> Z. et S. | 1500± |
| <i>Castanea crenata</i> BL. | 1000....1500 |
| <i>Clethra barbinervis</i> S. et Z. | 1500± |
| <i>Cercidiphyllum japonicum</i> S. et Z. | 1500± |
| <i>Cornus controversa</i> HEMSLE. | 1500± |
| <i>Cynoxylon japonica</i> NAKAI. | 1000....1500 |
| <i>Fagus crenata</i> BL. | 1000....1600 |
| <i>Fagus japonica</i> MAXIM. | 1000....1600 |
| <i>Fraxinus longicuspis</i> S. et Z. | 1500± |
| <i>Hamamelis japonica</i> S. et Z. | 1500± |
| <i>Hydrangea paniculata</i> SIEB. | 1600± |
| <i>Juglans Sieboldiana</i> MAXIM. | 1500± |
| <i>Magnolia obovata</i> THUNB. | 100....1500± |
| <i>Meisteria campanulata</i> NAKAI. | 1500± |
| <i>Micromeles alnifolia</i> KOEHNE. | 1100±.1500± |
| <i>Micromeles japonica</i> KOEHNE. | 1500± |
| <i>Phellodendron amurense</i> RUPR. | 1000....1600 |
| <i>Prunus Maximowiczii</i> RUPR. | 1500± |
| <i>Quercus crispula</i> BL. | 1000±.1600± |
| <i>Stewartia pseudo-camellia</i> MAXIM. | 1500± |
| <i>Thuja japonica</i> MAXIM. | 1500± |

21) HAYATA, B.: *Op. Cit.*, (1911); TAKEDA, K.: "The vegetation of Mt. Fuji." *Scientific Knowledge*, 4, July (1924) (in Japanese); KUSANO, S.: "The forest vegetation of Nikko," *Guide-Book, Excursion B-1, Pan-Pacific Sci. Cong. Tokyo*, (1926) 30; YABE, H.: *Op. Cit.*, p. (1928) 315; INOKUMA, T.: "Preliminary notes on ligneous plants indigenous in the "Chichibu" University forest and its adjacent districts." *Bull. Tokyo Imp. Univ. Forests*, 14, (1931); INOKUMA, T.: An enumeration of the ligneous plants indigenous to "Minobusan" and "Shichimenzan" in the Province of "Kai." *Op. cit.*, 18, Art. 2, (1934).

| | |
|-----------------------------------|-------|
| <i>Tilia japonica</i> SIMK. | 1600± |
| <i>Ulmus japonica</i> SARG. | 1500± |
| <i>Viburnum furcatum</i> BL. | 1500± |

On the other hand, H. YABE²²⁾ has shown on a comparative study of the terraces of the Siobara district, those outside of the mountainland and along the Utunomiya plain, and also those of the Kwantō region, that the Siobara fossil lake in which the plant beds had accumulated had an altitude 500–600m. above the sea level of that time. It is therefore obvious that there is a difference of some 900–1000 m. in altitude between the most favourable habitats of the one at the present and the other in the past, of nearly the same community of forest trees, which approximately corresponds to a temperature difference of 5° to 5.5°C., since the temperature is said to decrease in a rate of about 5.5°C. per 1000m. below 9000m.²³⁾ in central Japan at present. Consequently we must conclude with him that once during the Pleistocene, central Japan was a little cooler than now, mean annual temperature being 5.0°–5.5° lower.

There is an evidence on another line in favour of the above inference, which now comes to my thought. In general, the nature of leaf margin in dicotyledonous trees seems much to depend on climatic factors, the relative number of tree species bearing leaves with entire margin to those bearing leaves not entire along the

Table 5.

| | Climatic forest zones of Japan. | Entire leaves % | Doubly serrate and incised leaves % | Serrate serrulate and dentate etc. leaves % |
|------|---|-----------------------|--|--|
| I. | Warm-temperate. (Central and Southern Honsyū, Northern Kyū- syū and Northern Sikoku) | 56 | 1 | 43 |
| II. | Temperate. (Northern Honsyū and Southern Hokkaidō.) | 19 | 42 | 39 |
| III. | Frigid. (Northern Hokkaidō and Southern Karahuto) | 8 | 84 | 8 |

22) YABE, H.: *Op. cit.*, (1928), p. 317.

23) OKADA, T.: The meteorology, (1927), pp. 36, 534–545 (in Japanese).

margin increasing gradually from the frigid forest zone through temperate to warm-temperate. In the following table (Table 5) are given percentages of entire leaved trees to the total number of dicotyledonous trees growing in three regions each selected in frigid, temperate and warm-temperate forest zones of Japan.²⁴⁾

It will be remembered in this connection an early statement by BAILEY and SINNOTT²⁵⁾ which runs as follow:

"The percentage of entire leaved woody plants in the dicotyledonous flora, with regard to the climatic zones, is as follows:

Table 6.

| (I) Mesophytic-cold temperate. | | |
|--------------------------------|----------|--------------|
| | Entire % | Non entire % |
| Trees | 10 | 90 |
| Shrubs | 14 | 86 |
| Woody | 13 | 87 |
| (II) Moist-lowland-tropical. | | |
| Trees | 90 | 10 |
| Shrubs | 87 | 13 |
| Woody | 88 | 12 |

(The first flora (I), cold-temperate mesophytic, was constructed by eliminating from the flora of east-central North America; east of the 95th meridian and between the 40th and 50th parallels of latitude, all plants growing on physiologically dry environments. The second flora (II), tropical, was formed from the woody plants of the moist lowlands of the Amazon Valley.)

From this table (Table 6) it is clear that leaves with non-entire margins are of very infrequent occurrence in lowland tropical floras, and those with entire margins in mesophytic cold-temperate ones.

In fact the correlation between leaf structure and climate is so intimate in widely separated regions of the earth in the distribution of many families, genera and even species that modifying influences of environment are clearly demonstrated."

It is quite manifest from this table that the plants bearing leaves with non-entire margin are of a very infrequent occurrence in tropical lowland floras, while those bearing leaves with entire margin are likewise extremely rare in cold temperate mesophytic floras.

24) ENDÔ, S "On the relation between the climatic zones and the leaf margins of dicotyledonous trees." *Jour. Geogr. Soc. Tokyo*, **43**, (1931), pp. 231-234, (in Japanese). (Abstract) *Japan. Jour. Geol. Geogr.*, **9**, 1 & 2, (1931), p. 4.

25) BAILEY, J. W. and SINNOTT, E. W.: A botanical index of Cretaceous and Tertiary climates *Science*, New Series **41**, (1915), pp. 831-833.

We learn from the Table 5 given above that in northernmost Japan, which lies in the frigid forest zone, the percentage hardly amounts to 8, while it attains 13 in Hokkaidô and 56 in central and southern Japan.

In the Siobara flora, species of dicotyledonous trees are 68 in number so far as we know at present and those bearing leaves with entire margin 9, the percentage of the latter to the former being 13. In this percentage, therefore, the fossil flora closely approach the living one of central Hokkaidô, an evidence which confirms the view already expressed, namely that the climate of central Japan was much colder at least once in the Pleistocene than now, and was more or less similar to the conditions prevailing over central Hokkaidô in the present day.

A detailed description of Siobara flora will be given in a series of papers of which the first part was published in the Journal of Geology and Geography.

Finally I wish to express my sincere thanks to Professor Hisakatsu YABE of our Institute, for his kind support and efforts to facilitate this study, and to Professor EDWARD WILBER BERRY, the Johns Hopkins University, Baltimore, MD., for the valuable advice, the free use of his private library, and his all sided courtesy enjoyed during my stay in Baltimore.

3. 氣候狀況指示者としての日本更新世植物群 (摘要)

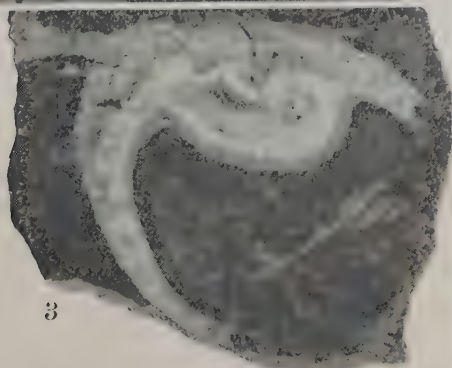
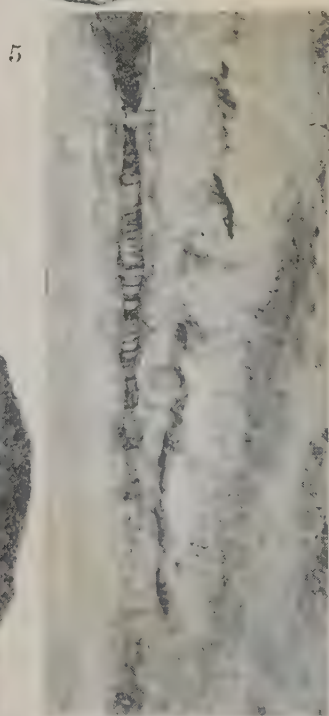
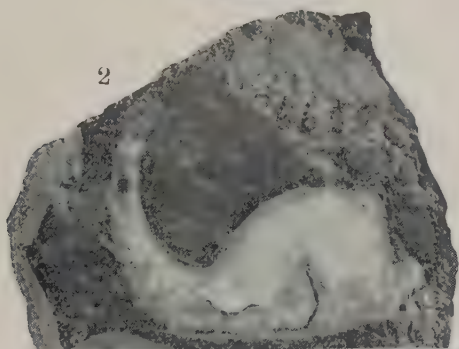
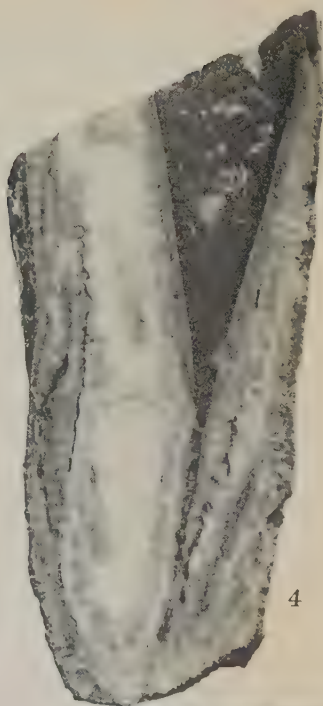
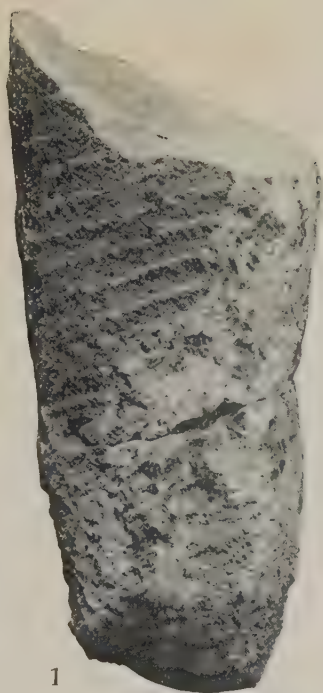
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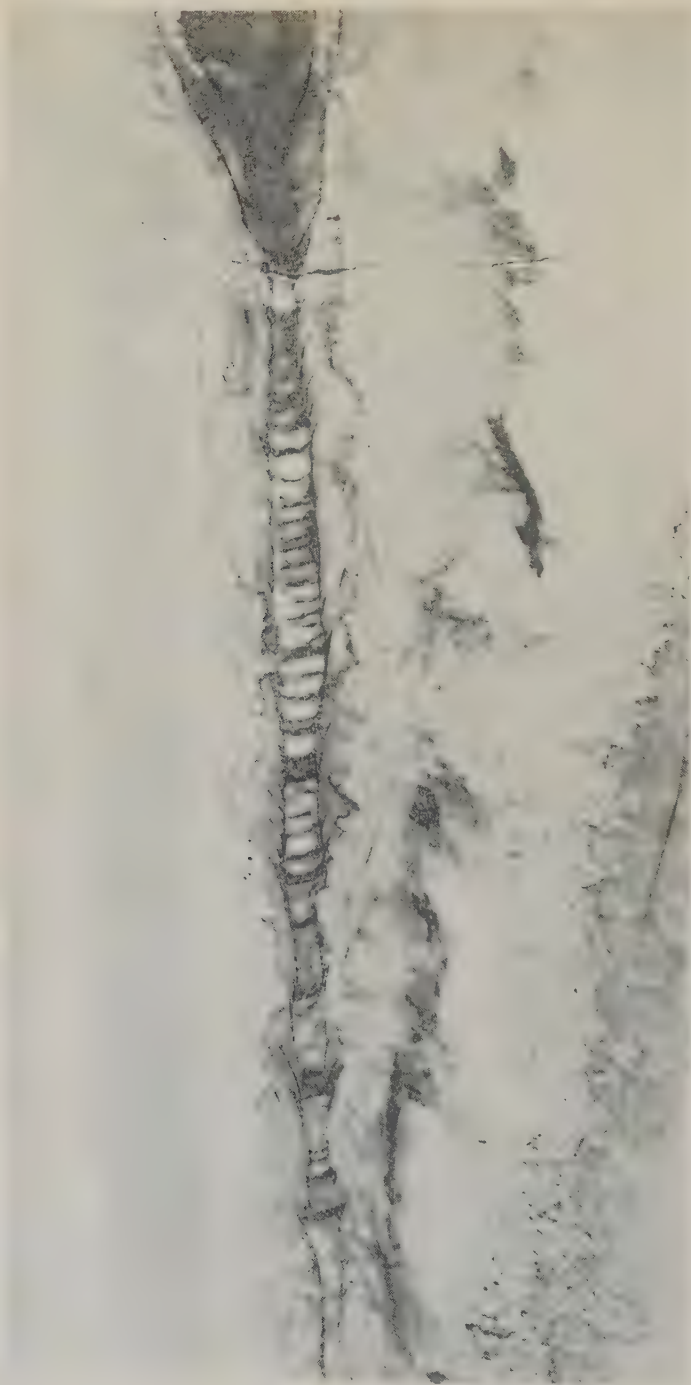
此論文は鹽原化石植物群の研究を根據として論じたものである。

鹽原化石植物群の地質時代は次の事項により第四紀更新世のものであつて第三紀時代の植物群ではない。則ち鹽原化石植物群には絶滅種の割合が非常に少ないこと、第二遠隔なる地方に現生する要素を缺くこと。第三かへで科植物の掌狀分裂葉の数は地質時代が近世に近づけば近づく程多數のものが認められる。而して鹽原化石植物群のかへで科中には第三紀時代に産出しない 11 葉以上の掌狀分裂葉をもつ *Acer japonicum* THUNB (はらちはかへで) 等があること、第四層位上及び地形上の對比から第四紀更新世のものと考へるのが最も適當であること、等から見て是は第三紀時代のものでなく第四紀更新世の植物群である。

次に鹽原化石植物群の指示する氣候は現在より餘程寒冷であつたものと見なければならぬ。則ち鹽原化石植物群を埋藏した當時の鹽原湖の海面よりの高度は 500 米乃至 600 米であつたと推論すべき十分な證據があるのに同化石植物群は現在本州中部に於て 1500 米附

近の高度のところか、又は北海道中南部に繁茂する植物群に彷彿たるものである。また植物の葉縁は氣候に關係して變化するものであるが、鹽原化石植物群の葉縁の状態は現在の北海道の植物群に類似して居ること等から考察して、當時の此地に於ける年平均溫度は現在より攝氏五度乃至五・五度低かりしものと見なければならぬ。





日本古生物學會報告

(Transaction of the Palaeontological Society of Japan)

4. *Restudy on Manchuroceras with a Brief Note on the Classification of Endoceroids.*

By

TEIICHI KOBAYASHI

(Contribution from the Geological Institute, Imperial University of Tokyo, Japan.)

1. OZAKI'S Description of *Manchuroceras*.
2. Observation on OZAKI'S Specimen.
3. Internal Structure of the Endosiphuncle.
4. Asiatic Species of *Piloceras*.
5. Classification and Phylogeny of Endoceroids and Piloceroids.
6. Acknowledgement.

1. *Ozaki's Description of Manchuroceras*:—In 1927 K. OZAKI¹⁾ instituted a new genus, *Manchuroceras*, on the basis of a cephalopod from the Wolungian (Lower Ordovician) limestone of Manchoukou. The English translation of his description (not literal) is as follows:—

External Feature.

- 1) Siphuncle large, cylindrical, rounded near the apex, supposed to be terminated in a hemispheric shape. Its apical end is not preserved.
- 2) A constriction is seen at a point about 30 mm. from the apical end.
- 3) Many annulations oblique to the axis of the siphuncle, run on the surface. These, however, are obsolete in the apical portion.
- 4) At a point about 30 mm. from the apex the siphuncle measures 25 mm. in diameter; four annulations or so are distributed in a distance of 10 mm.

Internal Structure.

- 5) In the longitudinal section the siphuncle has a tubular alveolus on the dorsal side. (Here OZAKI uses a term "dorsal" for the ventral). In the cross section the inner margin of the alveolus arched and its outer

1) K. OZAKI (1927), On a New Genus of Ordovician Cephalopoda from Manchuria, (Jour. Geol. Soc. Tokyo, Vol. XXXIV), pp. 45-50.

margin runs close to the outer margin of the siphuncle; and its interspaces filled with the stereoplasm.

6) The rest of the siphuncle is occupied by the main alveolus (i.e. endocone) which is communicated with the exterior of the siphuncle through an endosiphontube (i.e. endosiphuncle). It cannot be ascertained whether this has a mamillary sear at the apex or not.

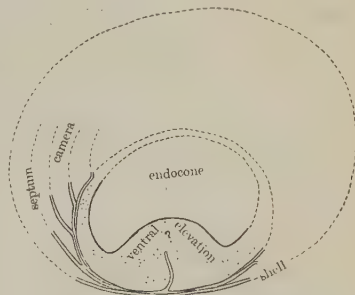
7) The ventral side of the main alveolus is concave and not flat.

Further, he adds the opinion that *Manchuroceras* is distinguished from *Chihlioceras* GRABAU in the number and shape of the lateral alveoli. He missed, however, the assignment of a specific name to the genotype in his description.

2. Observations on Ozaki's Specimen:—

The camerate portion is poorly preserved. The siphuncle is quite large, presumably as broad as half the shell-diameter or so. It has a weak constriction which, however, does not mark off the preseptal cones as that of *Proterocameroceras*, but both sides of the constriction are septate. In the transverse section (Pl. III, fig. 1, text-fig. 1,) a septum adnates with the shell on the flat venter; another septum does so with the preceding septum to some distance, outlining the siphuncle for 7 mm. Here it is detached from the siphuncle. Thus the siphuncular wall is understood to be composed of septal necks in double layers,—in other words, the feature reveals the invaginated septal funnel of the holochonitic type,—but no endosiphon lining of RUEDEMANN can be seen. Both above mentioned septa are broken off a short distance from the siphuncular wall. As it is the case of *Coreanoceras*,¹⁾ the shell and septa are rather thin and the camerae free from stereoplasmic deposits. These might be the reasons why the camerate portion was so easily destroyed.

On the external view of the siphuncle (Pl. III, fig. 1,) four septal sutures and three interspaces are distributed in 11 mm. where the dorso-ventral diameter of the siphuncle measures 29 mm. The



Text-figure 1. Cross section of
Manchuroceras wolungense
Kobayashi

1) T. KOBAYASHI (1931 A), Studies on the Ordovician Stratigraphy and Palaeontology of North Korea with Notes on the Ordovician Fossils of Shantung and Liaotung, (Bull. Geol. Surv. Chosen, (Korea), Vol. XI, No. 1), p. 45-48.

septal suture ascends from dorsum to venter for a distance of two and half septal distances, but they are obscured, though some of them traceable, on the venter.

In two cross section (Pl. III, figs. 2-3,) which are about 7 mm. apart from each other, the siphuncle is subcircular, more or less ovate, slightly depressed in the dorso-ventral direction and widely flattened on the venter; the endocone is off-center; the siphuncular wall increases its thickness from dorsum to venter and abruptly swells up inward, forming the "*ventral elevation*", in which respect *Manchuroceras* is more specialized than the Endoceratidae. As to its bearing on the animal life nothing is certain, but at least it is obvious that such an elevation serves for the mantle attachment very effectively.

A siphuncular channel runs along the ventral flattening some little distance and then traverses the ventral elevation, but it cannot be ascertained whether this channel has penetrated completely through the elevation or not, because on this specimen the stereoplasmic layers are crystallized on the inner side of the elevation. It is, however, certainly not a narrow tube, but has some longitudinal distance, since it can be seen in two sections 7 mm. apart. It is, therefore, a type of an "*endosiphoblade*" by RUEDEMANN¹⁾ or an "*endosiphobladet*" by HOLM. Through the research of *Coreanoceras* now being undertaken, I am inclined to believe that the endosiphoblade is a channel communicating the soft animal with the air chamber. In this regard it coincides with the diverticula in the actinoceroids. Further information will be presented in another paper which will appear in the future.

3. *Internal Structure of the Endosiphuncle*.:—An important observation can be made in the clear cut longitudinal section of the endosiphuncle (Pl. III, fig. 4.) The endocone has an apical angle of 25 degrees. At the apex is seen a dark material irregularly outlined, precisely a small cone with a short cylindrical elevation. A guess is that it may be the last encrustation on the endocone wall which has not been completed by the death of the animal. Since the height and breadth of the endosiphuncular segment diminish abruptly in the later part of the endosiphuncle, it is

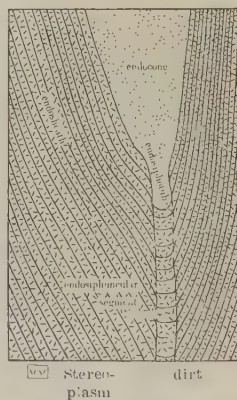
1) R. RUEDEMANN (1905), The Structure of some primitive Cephalopods, (N. Y. State Museum, Bull. 80), p. 304.

presumed that this portion reveals a senile stage of growth.

At the apical end, the endocone is connected with the so-called endosiphuncle, which in turn is divided into chains of *endosiphuncular segments* by a number of black tabulae. There is a tendency of the distance between the tabulae increasing from the apical side to another, but not regularly. (Text-fig. 2.)

J. F. WHITEAVES¹⁾ once stated that the endosiphuncle of *Endoceras crassisiphonatum* is partitioned by a few transverse concave dissepiments or "endosiphuncular partitions²⁾." Although I have not examined his specimen, it might be said that the interspace between the dissepiments is left vacant, or is filled up with dirt or "Spiess", since he compared these dissepiments to the diaphragms of *Diphragmoceras*. Further the partitions are very widely separated from one another in his illustration. On the contrary, in the specimen at hand the spaces between the black tabulae which are close-set, are filled up with stereoplasm, instead of dirt. Another distinction from WHITEAVE's example is the cone-in-cone structure of the endosiphuncular segments which is very clearly seen in a few places in the apical portion (pl. IV), and thereby the endosiphuncle changes its breadth abruptly.

In the later part of the endosiphuncle 17 segments are to be counted in a distance of 4 mm., where the endosiphuncular breadth measures 0.58 mm. at the maximum. In the same distance about the same number of the endosheathes are distributed. As the endosheathes are not so clearly defined from one another as the endosiphuncular segments, I cannot convince that each endosheath corresponds exactly to each endosiphuncular segment, although this appears to



Text-figure 2. Diagrammatic longitudinal section of the endosiphuncle

1) J. F. WHITEAVES (1891), The Orthoceratidae of the Trenton Limestone of the Winnipeg Basin, (Roy. Soc. Canada, Trans. Vol. IX, Sect. IV,) p. 79, pl. VI, figs. 1-4, pl. VII, fig. 1.

2) For WHITEAVES' dissepiment I used the term "endosiphuncular partition" in my paper "On the Phylogeny of the Primitive Nautiloids, with Descriptions of *Plectronoceras liaotungense*, new species, and *Iddingsia* (?) *shantungensis*, new species," (Japan. Jour. Geol. Geogr. Vol. XII, 1935), p. 22.

be likely.

On this specimen the endosheathes are interrupted to trace in the whole length from the endosiphuncle to the siphuncular wall by the obstruction of a crystalline body. A careful observation of it located in the middle of the ventral elevation reveals that the body is composed of crystalline calcite, layer by layer, irregularly outlined, but defined by no definite wall. Some trace of the endosheath fragment is still retained in the body.

In examining a number of Asiatic endoceroids and piloceroids, I noticed that it was quite common that the endosheathes were partly altered into calcite, and that various stages of such an alternation could be seen in the majority of specimens. Therefore, it may be easily understood by nautiloid students that the crystalline body which OZAKI once called a tubular alveolus is not an original structure, but is brought forth from the endosheath through a secondary crystallization of the stereoplasm.

Whether the endosiphuncle is closed or open at the apex, and how far the soft part of the animal has penetrated the space in the endosiphuncle have been moot questions. It is, however, quite seldom that we are able to find specimens with their internal structure so well preserved that we may make such an investigation. Since the discussions of the previous investigators have been summarized by RUEDEMANN,¹⁾ a repetition here has been avoided.

So far as the present specimen of *Manchuroceras* is concerned, the so-called endosiphuncle can be divided into a short vacant tube and a series of endosiphuncular segments, the latter of which are residual structures. For the former I wish to employ a RUEDEMANN's term "endosiphontube" hereafter. My opinion is that it is the endosiphuncle proper, or the apical end of the vacant endocone and it is definite that the soft animal cannot be extended beyond it. OZAKI's observation with regard to this is therefore incorrect.

In the course of the animal growth, the body is pushed forward, and simultaneously the stereoplasmic layers are secreted in the space left behind the animal. Thus the speed of calcareous secretion depends upon the growth of the animal which in turn,

1) R. RUEDEMANN (1905), Op. cit., p. 300.

is controlled under the condition of the environment and other factors. If the condition is favourable, the growth of the animal, consequently the secretion of the stereoplasm, proceeds very quickly. It happens sometimes, however, that regular cessations of growth occur causing stereoplasmic secretion to proceed very slowly or even cease completely, thus resulting in stereoplasmic deposits which are demarcated by lines. This aspect is similar to the year-ring in plants. RUEDEMANN¹⁾ said that such a periodicity of growth depends upon the reproductive times and the rest between.

Anyhow we should take the endosiphuncular segment, instead of the black tabulae themselves, as the unit of structure, and so the same for the endosheathes. Thus it is not the black line itself, but the layer between the lines which should be considered the endosheath. If the siphuncular segment is so defined, its magnitude is the exponent of growth. On this specimen for example, the increasing size of the endosiphuncular segment is explained by normal growth and the decrease in the last stage of senility.

4. *Asiatic Species of Piloceras*.:—Since GRABAU's description of *Piloceras platyventrum*²⁾ from the Lower Ordovician formation of Chihli, two species and one variety³⁾ have been added from North Chosen, South Manchuria and Shantung. These are as follows:—

Piloceras wolungense KOBAYASHI.

Piloceras wolungense, var. *compressum* KOBAYASHI.

Piloceras manchuriense ENDO.

Since no camerate portion of the conch of these Asiatic *Piloceras* have been discovered, the specific distinction among them is merely based upon the nature of the siphuncule, especially the

1) R. RUEDMANN (1921), Observations of the Mode of Life of Primitive Cephalopods, (Bull. Geol. Soc. Am. Vol. 32), p. 319.

2) A.W. GRABAU (1922), Ordovician Fossils from North China, (Palaeontol. Sinica, Ser. B, Vol. I, Fasc. 1).

3) T. KOBAYASHI (1931 B), Studies on the Stratigraphy and Palaeontology of the Cambro-Ordovician Formation of Hua-lien-chai and Niu-hsin-tai, South Manchuria, (Japan, Jour. Geol. Geogr. Vol. VIII,); (1931 A), Op. cit. R. ENDO (1932), The Canadian and Ordovician Formation and Fossils of South Manchuria, (U.S. Nat. Mus. Bull. 164).

rate of tapering, curvature, septal suture, cross section and other features of the siphuncle.

In examining ENDO's types in the United States National Museum at Washington, D. C., I found two forms to be distinguished. In the holotype (ENDO, Pl. 32, figs. 5-7,) the siphuncle is straight and circular in the cross section, while it is distinctly curved and rapidly increases its lateral diameter. In the paratype its cross section is considerably depressed in the dorso-ventral direction. (ENDO, Pl. 33, figs. 14-15.) Therefore I propose here a new specific name, *Manchuroceras endoi*, for the latter form in honour of Dr. RYUJI ENDO of the Educational Institute, South Manchurian Railway Company, Mukden, Manchoukou.

When compared with *Piloceras* s. str. which is prevalent in eastern North America and in Scotland, typified by *Piloceras invaginatium* SALTER, these Asiatic species are totally different in the following respects.

1) The siphuncle is subcircular or dorso-ventrally depressed into an ovate form in the Asiatic species, while it is subcircular or more commonly compressed laterally in *Piloceras* s. str. The lateral compression is very distinct in *Piloceras invaginatium*.

2) The siphuncle is marginal in the Asiatic form, instead of being submarginal as in the Atlantic one.

3) The siphuncle expands much more rapidly in *Piloceras* s. str. than in the Asiatic forms.

4) In the Asiatic forms the siphuncle is long and nearly straight, although curved to some extent, while it rapidly tapers in *Piloceras* s. str.

5) The mamillary scar frequently found at the apical end of the Asiatic form has never been observed in *Piloceras* s. str.

6) In *Piloceras* s. str. the endocone is subcentral, while it is off-center and its ventral side sometimes concave in the Asiatic form.

I consider these distinctions enough to segregate the Asiatic forms from *Piloceras* s. str. as a solid group. Ignoring the tabular alveolus, OZAKI's specimen of *Manchuroceras* which I have in hand, is, as far as I can see, identical with *Piloceras wolungense* KOBAYASHI. Therefore, to distinguish Asiatic species of *Piloceras* from *Piloceras* s. str. I recommend OZAKI's generic name, *Man-*

churoceras, whose genotype is naturally *Piloceras wolungense*. By the reason discussed above the generic diagnosis, however, requires some emendation in the following manner:—

Genus **Manchuroceras** OZAKI em. KOBAYASHI.

Breviconic orthoceracone, straight or little curved, subcircular to ovate in cross section; siphuncle large, cylindrical, straight or slightly curved, marginal, subcircular, or ovate and dorso-ventrally depressed in cross section; its ventral side frequently flattened; septa holchoanitic; septal suture oblique to the axis of the siphuncle, ascending from dorsum to venter; apical part of the siphuncle conical, sometimes provided with a mamillary sear; endocone off-center, close to the dorsum; its ventral wall mostly concave, forming the ventral elevation.

5. *Classification and Phylogeny of Endoceroids and Piloceroids*.—We paleontologists use a term “primitive” which is frequently rather subjective and ideal, but generally means either simple or archaic¹⁾. It is more real and objective only in the case that simplicity and archaism are combined. The Holochoanites, for example, was placed in the first suborder of the fossil nautiloids by HYATT. This idea was based presumably on the fact that the suborder was the oldest group available at that time and it was accepted by the nautiloid students until about ten years ago. If the organization is, however, considered, it is obvious that the Orthochoanites is much simpler than the Holochoanites. The situation naturally gives a chance for play of imagination as to which is really more primitive, Holochoanites or Orthochoanites.

In recognizing *Volborthella* as an ancestor of cephalopod, SCHINDEWOLF first argued on this regard. Since then the cephalopod-nature of *Volborthella* as well as *Salterella* of the Lower Cambrian have been discussed by TEICHERT, POULSEN, GÜRICH, SPATH and many others, but as yet none have arrived at a common agreement²⁾. On the other hand recent researches on primitive nautiloids date back to a period before the Canadian. From the

1) The primitive characters are sometimes based on the observations of the earlier stage of the ontogeny.

2) I believe that *Volborthella* is most probably a cephalopod, and at least closest to Cephalopoda than anything else.

Asiatic side I¹⁾ discovered facts which led me to conclude that HYATT's classification does not apply to Wanwanian cephalopods in fundamental lines. Subsequently ULRICH and FOERSTE,²⁾ in dealing with Ozakian material, clarify that the Diphragmida which prevailed in that period comprises of not only the holochoanoidal genera, but the ellipochoanoidal ones. Further, I deem that *Plectronoceras liaotungense* Kobayashi from the Upper Cambrian of Liaotung is the oldest and simplest, and thus the most primitive and unquestionable for its cephalopod-nature. The study³⁾ on this progenitor, therefore, makes clear the original branching of nautiloid-evolution.

In summarizing the results of my observations on Asiatic materials, it can be said with certainty that;

- 1). the length and curvature of the septal neck is variable even in one individual of the Plectronoceratidae,
- 2). the Upper Cambrian nautiloid is not a Holochoanites in the sense of HYATT, and
- 3). Holochoanites is not primitive, but highly specialized.

Further, as seen in the Plectronoceratidae, most of the archaic nautiloids have laterally compressed conchs with crowded septa and narrow marginal siphuncles on the ventral side. These primitive aspects are equally as well seen on the Ellesmereoceratidae. Further, most of the archaic cephalopods are straight or a little curved; quite a few gyroceratic; and none nautilonic. If the conch is cyrtoconic, the siphuncle is endogastric or located on the concave side.

Except for *Volborthella* and *Salterella*, the archaic cephalopods are distributed most abundantly on both sides of the northern Pacific where the center of the dispersal or migration is naturally expected. Only a few specimens of the basal Ordovician i.e. late Ozarkian cephalopods are procured from the Arctic region which are exclusively ellesmereoceroids. The Tremadocian strata in

1) T. KOBAYASHI (1933), Faunal Study of the Wanwanian (Basal Ordovician) Series and Special Notes on the Ribeiridae and the Ellesmereoceroids, (Jour. Fac. Sci. Imp. Univ. Tokyo, Sect. II, Vol. III, Pt. 7), pp. 302-309.

2) E. O. ULRICH and AUG. F. FOERSTE (1933), The Earliest known Cephalopods, (Science Vol. 78), pp. 288-289.

3) T. KOBAYASHI (1935), Op. cit., pp. 17-26, pl. VI.

northern Europe, since it is distant from the center of origin, yields little material. *Orthoceras* (?) *attavus* BRÖGGER¹⁾ in Norway is a tiny orthoceracone with a submarginal narrow siphuncle and crowded septa; *Orthoceras* (?) *sericeum* SALTER and *Cyrtoceras* (?) *praecox* SALTER²⁾ have also close-set septa, but their siphuncles are not well preserved. At any rate these primitive characteristics referred to above cannot be overlooked in Tremadocian cephalopods.

So far as I am aware, it appears to be a rule that, if the siphuncle is narrow, its internal structure is simple, and complicated structure like endoceroids are found only in those forms whose siphuncles are expanded to a certain magnitude. Since the structure of the siphon was simple at the beginning, it did not require much space in the siphuncle. The highly camerate forms are later appearance. The reasons are that the primitive nautiloid did not have the ability to push its body forward at one bound in the course of its growth.

Thus the complicity of the siphuncular structure depends upon the specialization of the siphon, or the soft part of the animal occupying the space of the siphuncle,—in other words, the increase of the siphuncular space, that is, the magnitude of the endocone advances in accordance with the complicity of the viscera.

As a result of this specialization the siphuncle increases its weight and consequently the animal presumably takes on a crawling habit. For this benthonic adaptation the cross section of the shell changes from a laterally compressed form into a dorso-ventrally depressed and ovate outline with a flattened venter. If the stereoplasmic deposits increase in the camerae as well as in the siphuncle, the animal is, after all, hardly capable of swimming. I, therefore, agree with TROEDSSON³⁾ and TEICHERT⁴⁾ in their interpretation that the heavy shelled cephalopod are benthos.

Thus, not only the length and curvature of the septal neck,

1) W.C. BRÖGGER (1882), Die Silurischen Etagen 2 und 3, p. 53, pl. IV, fig. 9-10, pl. X, fig. 6.

2) J.F. BLAKE (1882), A Monograph of the British Fossil Cephalopoda, Part I, Introduction and Silurian species.

3) T. TROEDSSON (1926), On the Middle and Upper Ordovician Faunas of Northern Greenland, I. Cephalopods (Julilaemsekspeditionen Nord om Grønland 1920-23, Nr. I,) p. 65.

4) C. TEICHERT (1935), Structures and Phylogeny of Actinoceroids, (Am. Jour. Sci. Vol. XXXIX,) p. 15.

but the coiling of the shell, cross section of the conch, position and size of the siphuncle, stereoplasmic deposits in the siphuncle and camerae, and other characteristics should be counted on for the natural classification. Unless the combination of these evolutionary characteristics are brought into consideration, we cannot read through the story of nautiloid evolution.

For example, if we follow HYATT, *Baltoceras* is an Orthoceratidae, but it is, in fact, quite distinct from other genera of the family. It is certainly better explained, as an orthochoanitic endoceroid. The feature of the septal neck in *Baltoceras* is simply due to that it improves more rapidly than it does in other endoceroids in this respect. Therefore, I myself believe that *Baltoceras* is derived from the stock of the Endoceratidae rather than from that of the Orthoceratidae.

By the same reason *Polygrammoceras endoceroides* TROEDSSON¹⁾ is segregated from the Kionoceratidae and here a new generic name *Troedssonella* is attached to it. Its generic significance is in the polygrammocero'id with the ellipsochoanoidal septa, endosheathes and endosiphuncle, its genotype being *P. endoceroides*.

On the other hand I am inclined to recognize that *Protocycloceras* or *Orygoceras*²⁾ is a Cycloceratidae or an Orthoceratidae with a holchoanitic siphuncle in which the evolution in reference to the septal character is retarded. Therefore the Protocycloceratidae (nov.) is so defined here that the cyclocero'id has a siphuncle of the holchoanitic type and sometimes partitions within the siphuncle.

From these points of view I am led to be sceptic as to whether the septal nature on which HYATT's major divisions are founded is of prime importance, or we can have a better explanation of the phylogeny and classification from other basis. The latter attempt has been initiated in my preceding paper³⁾ in which I have dealt with the initial branching of the Plectonoceratidae, Elles-

1) G. T. TROEDSSON (1932), Studies on Baltic Fossil Cephalopods, II, Vertically Striated or Fluted Orthoceracones in the *Orthoceras* Limestone, (Lund Universitets Arsskrift, N. F. Avd. 2, Bd. 28, Nr. 6,) p. 30. pl. III, figs. 2, 3, pl. IV, fig. 6.

2) A. F. FOERSTE (1924), Notes on American Paleozoic Cephalopods, (Jour. Sc. Lab. Denison, Univ. Bull. Vol. XX), pp. 202-203.

3) T. KOBAYASHI (1935), Op. cit., pp. 20-25.

mereoceratidae and Endoceratidae. Here the consideration is extended into the endoceroids and piloceroids and their relation to the orthoceroids.

In the majority of the Canadian and later Ordovician cephalopods it is quite easy to recognize two major groups, endoceroids and orthoceroids, but whether the former is derived from the latter or vice versa is a moot question. Between the two groups there are essential distinctions which cannot be overlooked. Besides the septal character, the former has mostly a narrow subcentral and simple siphuncle whereas the latter has a broad marginal or submarginal and complicate siphuncle. As discussed elsewhere¹⁾, the presence of the endosheath and endosiphuncle should be much more important characters for the latter group than the holocheanitic nature of the septa.

It is really quite seldom that we find the Holochoanites with a narrow and subcentral siphuncle. There are, however, a few exceptions, such as *Wolungoceras*²⁾ and *Chisiloceras*³⁾ which have subcentral siphuncles. These two genera differ mainly in the length of the septal neck. If the length diminishes still more than that of the *Wolungoceratidae* without endosheathes, it is quite possible that the *Orthoceratidae* will be introduced. *Chisiloceras*⁴⁾ in Caracorum is accompanied by *Nileus armadillo*, *Illaenus esmarki*, and other fossils, and the fauna, according to GORTANI, is the upper Arenigian or lower Llandeilian; *Wolungoceras* in

1) T. KOBAYASHI (1935), Op. cit., p. 20-25.

2) T. KOBAYASHI (1931 B), Op. cit. p. 166.

3) M. GORTANI (1934), Fossili Ordoviciani del Caracorum, pp. 68.

4) According to GORTANI, *Chisiloceras* is an orthoceracone without any transverse annulation and longitudinal costae; its cross section circular or only a little elliptical; siphuncle large, central or subcentral; the septal funnel prolonged beyond the preceding septal neck. In short, *Chisiloceras* is an *Orthoceras* in outline, but has a siphuncle of *Waginiceras* type; in other words, it is *Waginiceras* except for the central siphuncle.

Further *Chisiloceras* is allied to *Wolungoceras* KOBAYASHI in the Ordovician of Manchuria, but in comparison with it, *Chisiloceras* has a much more prolonged endocone and a greater number of endosheathes. We can say exactly that the relation of *Chisiloceras* to *Wolungoceras* is just like the relation of *Waginiceras* to *Endoceras*.

The genus comprises of *Chisiloceras marinellii* and *Chisiloceras dainellii* among which the former is selected for the genotype, because it shows the diagnostic characters more clearly than the latter.

Eastern Asia is the Wolungian and older formations.

It is interesting to note that the Wanwanian *Wolungoceras chinshuense*¹⁾ has a siphuncle shifted from the center to the ventral side to some distance, in which respect it is intermediate between the Plectronoceratidae and Wolungoceratidae.

FOERSTE once claimed that no ellipchoanoidal cephalopod has been found before the Chazyan, and this result is still accepted, if the ellipchoanoidal cephalopod is not taken in the sense of HYATT, but with a substitution of absent siphuncular partition. The Chikunsan, approximately contemporaneous with the Llan-deilian of Europe and Chazyan of North America, is a period of Orthoceroid-divergence.

Based upon these grounds I found it reasonable to consider that from the stock of the Wolungoceratidae the Orthoceratidae is branched off, from which in turn the Actinoceratidae is brought forth through *Sactorthoceras*. Regarding the latter account I have already discussed on some occasion.²⁾ It must, however, be remembered that the Orthoceratidae and Wolungoceratidae should have diverged from the common evolutionary line before the time when the latter acquired the endosheath structure.

Another question not yet well clarified is whether the Wolungoceratidae is derived from the Ellesmereoceratidae, or derived directly from the common ancestral stock with the Plectronoceratidae and Ellesmereoceratidae. It is, however, more certain that excepting the Wolungoceratidae branch, most of the endoceroids and piloceroids are descendants from the Ellesmereoceratidae. These two groups are more advanced and complicated than the Ellesmereoceratidae with regard to the siphuncular structure.

Since the Piloceratidae is characterized by a lateral compression of the conch, it is presumed that it branched off from the Ellesmereoceratidae line and not through the Endoceratidae. The Cyrtendoceratidae and Baltoceratidae are side off-shoots from the Endoceratidae. The former is improved in regard to coiling of conch; the latter in regard to septal nature.

1) T. KOBAYASHI (1933), Op. cit., p. 275, pl. III, fig. 4.

2) T. KOBAYASHI (1934), The Cambro-Ordovician Formations and Faunas of South Chosen, Palaeontology Pt. I, Middle Ordovician Faunas, (Jour. Fac. Sci. Imp. Univ. Tokyo, Sect. II, Vol. III, Pt. 8,) pp. 429-432.

In my opinion it is hard to group *Chihlioceras* and *Piloceras* s. str. in one family and GRABAU is correct to establish the Chihlioceratidae for the former in which *Coreanoceras* should be involved. The question is in *Manchuroceras* which is intermediate in character between the Endoceratidae and Chihlioceratidae. It differs from the Endoceratidae in its large complicate siphuncle and small mammillary scar, but it is certainly a Holochoanites. Nothing definite is known as yet of the septal nature of the Chihlioceratidae but well preserved specimens of *Coreanoceras* which I am now studying, project a doubt that it may not be a normal Holochoanites. Therefore, I consider that it is wise to separate the Manchuroceratidae from the Chihlioceratidae.

A question of the endoceroid to be left for future research is the bearing of the apical bulb on the phylogeny and classification. At any rate there are a group of endoceroids which have a siphuncular bulb at the apex and they are well known in Europe and North America. *Penhsihoceras* is an example of this kind known from Eastern Asia. ENDO¹⁾ has established *Penhsihoceras* out of *Penhsihoceras fusiforme* ENDO which is a long, straight and cylindrical siphuncle with an apical bulb. He compared it with *Piloceras* and *Chihlioceras* and placed it in the Piloceratidae, but by some unknown reason he missed to compare it with *Nanno* and *Succoceras* with which it should be put in array. As a result, the phylogenetical relation of the Cambro-Ordovician nautiloids is demonstrated in the following table (on page 49.)

Finally the Upper Cambrian and Ordovician ellesmereoceroids, endoceroids, and piloceroids are classified as follows:—

I. Plectronoceratidae KOBAYASHI 1935.

II. Ellesmereoceratidae KOBAYASHI, 1934.

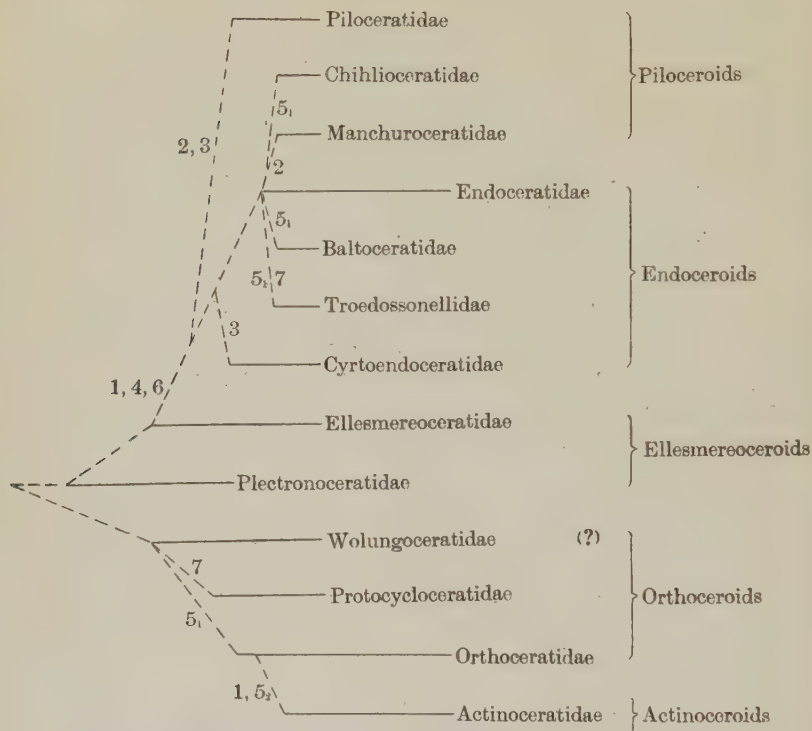
III. Endoceratidae HYATT, 1884.

Section 1. *Endoceras* HALL, *Vaginoceras* HYATT, *Cameroceras* CONRAD, *Kotoceras* KOBAYASHI,²⁾ *Paravaginoceras* KOBAYASHI.

1) R. Endo. (1932), Op. cit., pp. 64-65, Pl. 32, figs. 8-10.

2) It is unfortunate that *Kotoceras* KOBAYASHI, 1934, is duplicated by YABE's *Kotoceras*, 1927, (Sci. Rept. Tohoku Imp. Univ. Vol. XI, No. 1. 1927, p. 44), but still more unfortunate is it that SHIMIZU and OBATA have proposed *Subvaginoceras* 1935, for my *Kotoceras* by this duplication, (Chikyu, the Globe, Vol. XXIV, No. 2, 1935). This proposal is, however, nullified by the reason that *Kotoceras* Yabe is *nom nudum*, and *Kotoceras* KOBAYASHI is a valid name.

Table showing the phylogenetical relation of the primitive nautiloids.



Evolutional Trends

- 1) Cross section of the shell. (laterally compressed → subcircular → dorso-ventrally depressed.)
- 2) Length of the shell. (longiconic → breviconic.)
- 3) Coiling of the shell (orthoconic → cyrtconic → gyroceratonic → nautiliconic.)
- 4) Camera-height (short → broad.)
- 5) Septal character.
 1. (holochoanoidal → ellipchoanoidal.)
 - 2.* (orthochoantic → cyrtchoanitic.)
- 6) Siphuncular structure, (diaphragm → endosheathes and endosiphuncle.)
- 7) Surface ornamentation.

Note:—The Wolungoceratidae might be located close to the Troedossionellidae.

Section II. *Cyclendoceras* GRABAU & SHIMER, *Kawasakiceras* KOBAYASHI.

Section III. *Cyrtovaginoceras* KOBAYASHI.

Section IV. *Nanno* CLARK, *Sueccoceras* HOLM, *Proterocameroceras* RUEDEMANN, *Penhsioceras* ENDO.

IV. Wolungoceratidae KOBAYASHI. (nov.) Endoceroids with a

subcentral siphuncle, or the Orthoceratidae with a holochaoanitic siphuncle. Endosheathes present in the later form.

Wolungoceras KOBAYASHI, *Chisiloceras* GORTANI.

- V. Baltoceratidae KOBAYASHI, (nov.) Endoceroids with an orthochaoanitic, marginal or submarginal siphuncle.

Baltoceras HOLM.

- VI. Troedssonellidae KOBAYASHI, (nov.) (See page 45)

Troedssonella KOBAYASHI, (nov.)

- VII. Piloceratidae MILLER, 1889.

Piloceras SALTER.

- VIII. Cyrtendoceratidae HYATT, 1896.

Cyrtendoceras RÉMÉLÉ.

- IX. Manchuroceratidae KOBAYASHI, (nov.) Breviconic endoceroids with a ventral elevation in the siphuncle.

Manchuroceras OZAKI em. KOBAYASHI.

- X. Chihlioceratidae GRABAU, 1922.

Chihlioceras GRABAU, *Coreanoceras* KOBAYASHI.

6. *Acknowledgement*:—During my stay in North America I was able to examine a number of *Piloceras* in the United States National Museum at Washington, D. C., in the New York State Museum at Albany, N. Y., in the Victoria Memorial Museum at Ottawa, and in other places for comparison with Asiatic piloceroids; and had an opportunity to discuss with Dr. AUG. F. FOERSTE on this group of cephalopods. In Italy I could see the types of *Chisiloceras* in the Geological Institute, R. University of Florence. Since I returned, Prof H. YABE of the Geological Institute, Tohoku Imperial University at Sendai bestowed upon me the privilege of revising OZAKI's specimen. My sincere thanks are due to Dr. R. S. BASSLER, Dr. RUD. RUEDEMANN, Dr. E. M. KINDLE, Dr. AUG. F. FOERSTE, Prof. G. DAINELLI and Prof. H. YABE.

(摘 要)

マンチュロセラスの再研究とエンドセロイドの分類に就いて

小 林 貞 一

1) 尾崎金右衛門氏のマンチュロセラスの記載を英譯し、2) 其の原品に對する余の觀察を記す。先づ其のセプタのホロコアニティツクなることを證し、體管の腹側に腹側隆起が存

在し、之を endosiphoblade の貫通すること、3) endosiphuncle が endosiphotube と endosiphuncular segments とよりなり、内臓は前者を限りとし、後者は生物の生長に伴ひ後方に残されたる沈澱物の充填部にして、生物は endosiphuncle を通じて外界と通じゐたるものに非ざること、及び尾崎氏の管狀窩は endosheath を構成せる stereoplasm の再結晶に依つて生じたる二次的構造なることを述ぶ。

4) 東亞の所謂 *Piloceras* を眞の *Piloceras* と比較し、其の識別六項目を數へ、東亞の *Piloceras* を屬として *Piloceras* s. str. より分離し、之に對して、尾崎氏の屬名を採用し、其の基本型として *Piloceras wolungense* KOBAYASHI を選び、屬の記載を訂正す。

5) ハイヤットの分類を難じ、新たなる立場より系統分類を立て、附表(第49頁)の如き系統を提案する。

本論文を通じて提唱されたる新科、新屬、新種は次の如し。

Manchuroceras OZAKI em. KOBAYASHI

Manchuroceras endoi KOBAYASHI

Troedssonella KOBAYASHI

Protocycloceratidae KOBAYASHI

Manchuroceratidae KOBAYASHI

Wolungoceratidae KOBAYASHI

Baltoceratidae KOBAYASHI

Troedssonellidae KOBAYASHI

Explanation of Plate 20(III).

Manchuroceras wolungense (KOBAYASHI.)

Figure 1. Lateral view of the siphuncle.

Figures 2-3. Polished cross sections slightly oblique to the axis of the Siphuncle. The two sections are apart 6 to 8 mm. from each other.

Figure. 4. Polished longitudinal section.

All magnified one and half times.

Figure 5. Polished longitudinal section of the endosiphuncle; X4; untouched.

Explanation of Plate 21(IV).

Manchuroceras wolungense (KOBAYASHI).

Polished longitudinal section of the endosiphuncle retouched by the author, X 14.

The specimen kept in the Geol. Inst., Tohoku Imp. Univ. Sendai, Japan.

5. 樺太氣屯産 *Desmostylus*: *D. mirabilis* nov.

長 尾 巧

(Read November 30th, 1935.)

一昨年五月樺太國境附近氣屯川支流にて發見された *Desmostylus* の頭骨を入手した後余は大石學士と共に同年秋及昨年夏の兩回に亙つて其骨骼採掘に従事した。其標本を既知の種と比較した結果未知のものであることを知つたので茲に新しく *Desmostylus mirabilis* なる種名を與へることとする。

Desmostylus で既に知られた種は次の 2 である。

1. *D. hesperus* MARSH (Amer. Jour. Sci., Ser. 3, 35, 1888):

Genotype.¹⁾

2. *D. japonicus* TOKUNAGA and IWASAKI (Jour. Geol. Soc.

Tokyo, Vol. 21, 1914).²⁾

樺太氣屯産のものでは上顎 M^2 が既に使用されてゐる點から見てオレゴン産の頭骨より老齡であり、又美濃産頭骨に比し上下兩顎第二大臼齒の磨滅が大きいから多少老いたものでないかと考へる。本頭骨では諸部が保存されてゐるにも拘らず從來の壓縮に依つて著しく變形し、特に頭部上面が左から右に押されてゐる。この爲或場所では幅が元來よりも餘程狭くなり、高さは減じて元來よりも扁平である。其結果既知の兩頭骨と各部の割合を比較することが充分に

1) Type specimens: 數個の齒又は其破片及腰椎骨等。產地: 最初カリフォルニアの Alameda Co. とされたが, MERRIAM によれば同州 Contra Costa であるといふ。オレゴン州 Yaquina 灣産の頭骨は本種とされてゐる。

2) Syn.: *D. watasei* HAY (Proc. U. S. Nat. Mus. 49, 1915). Type specimen: 齒を具へたる頭骨の一部 (YOSHIWARA and IWASAKI, Jour. Coll. Sci. Imp. Univ. Tokyo, 61, 6, 1902). 產地: 美濃國土岐郡明世村戸狩。

出来ない。特に美濃産のものとは彼れに保存されてゐる部分が此れで缺けてゐるといふ状態にあるので只齒を比較し得るにとどまる。

***D. hesperus* との比較。**頭骨の大きさは樺太産のものにて可なり大である。例へば眼窩の前縁より頭骨後端迄の距離は樺太産 ca. 34 cm. オレゴン産では (HAY の圖から計つて) ca. 19 cm. この比は $1:0.56$, 又顴骨前端より頭骨後端迄の距離は ca. 28 cm.: ca. 17.5 cm. ($=1:0.62$) である。又頭骨後端面の幅 (左右の乳頭の外端を結ぶ距離) は樺太産のものでは復舊すると ca. 30 cm. オレゴン産では ca. 19 cm. (この比は $1:0.63$)。かくの如く兩者には大いさの差が見られる。他方各部の幅は樺太産のものでは前記の如く著しく變形してゐるが、割合によく保存されてゐる前頭・顛頂部を比較するとオレゴン産のものに比し可なり幅が狭い様である。即ち外耳孔前方の位置に於て顛頂骨の左右兩縁間の距離は樺太種で ca. 14 cm. オレゴン産で (圖から計つて) ca. 10.5 cm. (この比は $1:0.75$), 即ち後者に於て幅が割合に廣い譯である。

次に齒に關してはオレゴン産のものでは充分明かでない。上顎 M^2 は HAY の記すところでは長さ 51 mm. 幅 33 mm. (MERRIAM が示した Coalinga 北方産の齒は長さ 64 mm. 幅 41 mm.) であつて、樺太の頭骨にある M^2 は夫々 76 mm. 及 48 mm. で、即ち前者は著しく小さい。但し形は兩者に於て餘程相類似する。又上記頭骨とは恐らく別個體に屬すると思はれる同產地よりの上顎 P^4 を HAY が示してゐるが、これは略同大の 4 柱からなり樺太産のそれとは外見上異なつてゐる。後者では前端内側に位する柱は他の柱に比し非常に小さい。

***D. japonicus* との比較。**前記の如く比較し得られるのは只齒である。美濃産頭骨の上顎 M^2 は長さ 73 mm. であつて樺太のそれ (長さ 76 mm.) と略同大であるが幅は 38 mm. であるから後者 (48 mm.) に比し幅が著しく狭い。又 P^4 は樺太産のものでは割合上小形で且つ 4 柱の内、前内側の 1 柱は他の柱に比し著しく小である。然るに美濃産のものでは前及外側の 2 柱が大きく、後部にある 2 柱特に後内側の柱は甚だ小形である。更に M^3 に就ては美濃産では外部から全體を見ることは出来ぬが、少くとも觀察される限りでは各柱は

著しく細長くて容易に樺太産のものと區別される。

次に下顎に關しては若し美濃産頭骨の 3 齒は別稿に記す如く夫々 $P_4M_1M_2$ とすれば M_2 のみが兩者に共通して見られる譯で、この齒は美濃産では少しく小形、6 柱からなつてゐる。樺太産では 7 柱あつて最後列は 3 柱を見る。この 6 柱といひ 7 柱といふことはたとへ其成立ちには多少相互に連絡あることが別稿に記す様に明かであるにしても、形の上に可なり區別がある。前者 美濃産) では長さ 64 mm. 幅 40 mm. 後者では長さ 68 mm. 幅 45 mm. (長さとの幅の比は前者では 1 : 0.625, 後者では 1 : 0.662) 即ち後者に於て幅が割合大である。以上述べた如く種々の差異が見られるので、たとへ *Desmostylus* の種内での變異が未だ充分判明せぬにしても茲に兩者を區別するか適當と考へられる。

序に樺太西岸亞牛より報告された下顎 M_2 ¹⁾ は上記の氣屯産のものに比し大形 (長さ 82 mm. 幅 50 mm.) であつて特に長さが長い點で大いに異なるが、然し柱狀體の配列は寧ろ類似してゐる。この大いさの相違は或は性別によるか、又別種であるかは今明かでない。故に暫く *D. cf. mirabilis* として置くこととする。

1) 齋藤文雄：樺太野久線亞牛附近の土本地質，地學雜誌，41 (1929) p. 364.

佐伯四郎：“樺太に發見されたる第三紀海牛の齒”，地質學雜誌，35 (1928) p. 569

5. *Desmostylus mirabilis* nov. from Saghalin (Résumé)

By

TAKUMI NAGAO

A name *Desmostylus mirabilis* nov. is proposed for the remain recently acquired from a tributary of the Keton-gawa in Japanese Saghalin, which, the writer thinks, represents a species distinct from *D. hesperus* MARSH and *D. japonicus* TOKUNAGA and IWASAKI, the two well established species of the genus. It has a much larger skull with a narrower parietal region and a smaller interanterior column of the last upper premolar than the Oregon form and differs from *D. japonicus* in being provided with a broader M^2 and a smaller P^4 in the upper jaw and a broader M_2 in the lower. The columns of the lower M_2 are in the new species 7 in number instead of being 6 and those of the upper M^2 seem to be less slender.

日本古生物學會記事

昭和10年5月5日 日本地質學會總會にて規則改正し「部會ヲ設クルコトヲ得」の規則を設け、日本古生物學會を日本地質學會の部會として設立し得る端緒を作る。

6月29日 日本古生物學會創立總會を開き、こゝに初めて日本地質學會部會として日本古生物學會創立せり。創立總會會長挨拶の要旨次の通り。

古生物學會創立總會挨拶要旨

本邦に於ける古生物學研究に従事するもの、最近25年間著しく増加し、其研究の報告機關の一として、且つは協力に便せん爲に古生物學會の結成が永く待望せらるゝ處であつたが、たまたま一昨年ワシントンにて開催せられたる萬國地質學會議出席の各國古生物學者に依り International Palaeontological Union を創立することゝなり、其代表機關を本邦に於いても形成する必要を生ずるに至りたるより、是れを好機として有志相集り今日こゝに日本地質學會の部會として日本古生物學會の創立を見たるは誠に慶賀に耐えざる次第である。吾人は今後此機關を通じて、更に一層、斯學の進歩發達の爲、努力を希望するものであります。

當日の出席者次の如し。

創立總會出席者

| | | | | |
|---------|---------|---------|---------|---------|
| 伊 木 常 誠 | 井 上 禧之助 | 伊 原 敬之助 | 大炊御門經輝 | 大塚 彌之助 |
| 金 原 均 二 | 金 原 信 泰 | 加 藤 武 夫 | 清 野 信 雄 | 小 林 貞 一 |
| 齋 藤 和 夫 | 坂 倉 勝 彦 | 下 平 文 男 | 杉 健 一 | 鈴 木 好 一 |
| 鈴 木 敏 | 高 井 冬 二 | 徳 田 貞 一 | 徳 永 重 康 | 中 井 猛之進 |
| 新 谷 壽 三 | 西 尾 銈次郎 | 藤 本 治 義 | 牧 野 孝三郎 | 槇 山 次 郎 |
| 松 澤 勲 | 村 上 飯 藏 | 矢 部 長 克 | | |

創立總會に於いて次の役員選舉せらる。

會 長 矢 部 長 克

| | | | | |
|---------|----------|-----------|---------|---------|
| 評 議 委 員 | 伊 木 常 誠 | 井 上 禧之助 | *大炊御門經輝 | *大塚 彌之助 |
| | 大 村 一 藏 | 加 藤 武 夫 | 金 原 信 泰 | 木 村 六 郎 |
| | *小 林 貞 一 | 立 岩 麿 | 中 村 新太郎 | 長 尾 巧 |
| | *徳 永 重 康 | 早 坂 一 郎 | 藤 本 治 義 | 村 上 飯 藏 |
| | *矢 部 長 克 | (* は常務委員) | | |

日本古生物學會規則次の通り。

日本古生物學會規則

1. 本會は日本地質學會の部會にして日本古生物學會と稱す
2. 本會は古生物學及び之れに關する諸學科の進歩を助け斯學の普及を圖るを以て目的とす
3. 本會は第二條の目的を達するために總會及講演會を開く

4. 本會の記事及び會員の寄稿は地質學雜誌に掲載し其の別刷を日本地質學會々員にあらざる本會々員に配布す
5. 本會の會費は年額參圓とす、但し日本地質學會々員は年額壹圓とす
6. 本會に次の役員を置く

| | |
|-------|-----|
| 會 長 | 1 名 |
| 評 議 員 | 數 名 |

- 7 役員の任期を1ケ年とし會員中より總會に於て選舉す

7 月 11 日 日本古生物學會評議委員會開催。

11 月 30 日 日本古生物學會第 1 回講演會を東京帝國大學地質學教室内に開く、講演者並に題目次の如し。

會 長 演 說

Twinned or double fossil shell of *Rotalia*. (代讀)

臺灣太魯閣峽上流所謂粘板系產有孔蟲化石

On occurrence of *Temnotrema rubrum* in the Pleistocene
of Turumi. (代讀)

Restudy on *Manchuroceras* with brief note on the classification of Endoceroids.

Coreanoceras, one of the most specialized Piloceroids,
and its benthonic adaptation.

Some molluscan remains from the Pleistocene deposits
of the Kwanto region.

Pseudopythina の化石に就いて

Serripes in Japan.

埼玉縣加須町附近の東京層

內蒙古產化石モノアラガヒ類に就いて

滿洲國哈爾賓附近の洪積世化石貝類及び現生貝類に就いて

滿洲熱河產古生代植物化石の一二に就いて

滿洲熱河產リコプテラの埋積狀態に就いて

明石產象の一新種

東部瀬戸内海に沿へる陸地より出土の象化石

樺太氣屯產 *Desmostylus*: *D. mirabilis* nov. (代讀)

Pleistocene flora of Japan as an indicator of climatic
condition. (代讀)

石灰藻の化石に就いて

Note on the genus *Engelhardtia* and its occurrence in
the Palaeogene of Korea. (代讀)

天然記念物に指定されたる化石

矢 部 長 克

Ichiro HAYASAKA

藤 本 治 義

長 島 乙 吉

Syozo NISIYAMA

Teiichi KOBAYASHI

Teiichi KOBAYASHI

Tuneteru OINOMIKADO

大炊御門 經 輝

Yanosuke OTUKA

大塚 彌 之 助

鈴 木 好 一

鈴 木 好 一

松 澤 勲

齋 藤 和 夫

高 井 冬 二

德 永 重 康

長 尾 巧

Seido ENDO

石 島 涉

Saburo OISHI

脇 水 鐵 五 郎

第一回講演會後評議委員會を開く。

11 月末日迄の會員總計 283 名；* を附せるは日本古生物學會規則による部會のみの會員なり。

| | | | | |
|--------|--------|--------|--------|--------|
| *青木文一郎 | 青木廉二郎 | 赤木健 | 浅井郁太郎 | 浅野五郎 |
| 浅野清 | 阿部廣吉 | 阿部顯 | *荒木武夫 | 安藤昌三郎 |
| 飯塚保五郎 | 飯山敏春 | 伊木常誠 | 伊藤貞市 | 伊藤顯次 |
| 伊原敬之助 | 池上隆 | 池邊展生 | 石井清彦 | 石川成章 |
| 石川武男 | 石島涉 | 石橋正夫 | 市川新松 | 市川渡 |
| 市村毅 | 稻井豐 | 稻垣誠二 | 井上禪之助 | 井尻正二 |
| 岩佐徳三郎 | 岩井淳一 | 岩本庄太郎 | 今井喜代志 | 今井半次郎 |
| 今村外治 | 上床國夫 | 上治寅次郎 | 上前一雄 | 植田房雄 |
| 植村癸巳雄 | 内田涵二 | 牛島信義 | 宇佐美衛 | 江口元起 |
| 江原眞伍 | 江本皓千代 | 遠藤誠道 | 遠藤隆次 | 大石三郎 |
| 大炊御門經輝 | 大木謙一 | 大杉徴 | 大谷壽雄 | 大立目謙一郎 |
| 大塚彌之助 | 大瀬知雄 | 大橋良一 | 大町四郎 | 大村一藏 |
| 大脇巖 | *太田恭 | *小倉謙 | *岡田彌一郎 | 岡田清藏 |
| 岡本要八郎 | 奥津春生 | 尾崎金右衛門 | 尾崎博 | 小倉勉 |
| 小野山武文 | 小貫義男 | 小幡忠宏 | 荻原武平 | 柿原明十 |
| 片山勝二 | 加藤武夫 | 川崎繁太郎 | 河村信一 | 金原信泰 |
| 金原均二 | 矢信之 | 兼子勝 | 神山貞二 | 龜井千勝 |
| 笠井章 | 木原二壯 | 木下龜城 | *木村義弘 | 木村六郎 |
| 清野信雄 | 桐谷文雄 | 黒澤守 | *黒田徳米 | 小泉源一 |
| 小岩井兼輝 | 小平亮二 | 小林儀一郎 | 小林貞一 | 小林學 |
| 近藤次彦 | 近藤忠三 | *小島信夫 | 今野圓藏 | *兒島勘次 |
| 後閑文之助 | 齋藤一 | 齋藤文雄 | 齋藤和夫 | 齋藤林次 |
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Constitution of the Palaeontological Society of Japan.

- Article 1. This Society shall be known as the Palaeontological Society of Japan. It forms a section of the Geological Society of Japan.
- Article 2. The object of this Society is the promotion of palaeontology and related sciences.
- Article 3. This Society to execute the scheme outlined under Article 2, shall hold annual meetings and discussions.
- Article 4. Proceedings of the Society and articles for publication shall be published through the Journal of the Geological Society of Japan. Separates and circulations will be sent to members of the Palaeontological Society who are not members of the Geological Society of Japan.
- Article 5. The annual dues of this Society is two dollars for the foreign members of the Society.
- Article 6. This Society shall hold the following executives, President one person, Councils several persons.
- Article 7. The President and Councils shall be elected annually. The President and Councils shall be elected from the Society body by vote of its members. All elections shall be ballot.

日本古生物學會規則

1. 本會ハ日本地質學會ノ部會ニシテ日本古生物學會ト稱ス
2. 本會ハ古生物學及ビ之レニ關スル諸學科ノ進歩ヲ助ケ斯學ノ普及ヲ圖ルヲ以テ目的トス
3. 本會ハ第2條ノ目的ヲ達スルタメニ總會及講演會ヲ開ク
4. 本會ノ紀事及ビ會員ノ寄稿ハ地質學雜誌ニ掲載シ其ノ別刷ヲ日本地質學會々員ニアラザル本會々員ニ配布ス
5. 本會ノ會費ハ年額3圓トス、但シ日本地質學會々員ハ年額1圓トス
6. 本會ニ次ノ役員ヲ置ク

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| 評 議 員 | 數 | 名 |

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(* Executive committee)

All Communications relating to this Journal should be addressed to the

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Geological Institute, Faculty of Science, Imperial University of Tokyo, Japan